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The Farmer's Digest

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The Farmer's Digest

Volume 7 March, 1944 Number 10

The Big Five in Management

Condensed from American Poultry Journal

G. T. Klein

Extension Poultryman, Massachusetts

ONE man, if he has suitable equipment, can feed, water and care for 3000 hens. He can do it leisurely, and in addition grade and pack the eggs. Omitting the egg work, this number can be increased to 5000 or even more.

The formula is found in five modern practices: the big five in management.

Pits
Large Room
Running Water
Built Up Litter
Handy Feed Rooms

Pits are not the answer to all of a poultryman's prayers, but they have many counts to their favor. Built about 18 inches high, newly housed pullets take to them the first night. They are kind to the bird that jumps from them to the floor. Body injury is nil, and this is more than can be said for droppings boards.

Wooden strips have replaced heavy wire which has gone to war. Strips 1½ inches apart work even better than wire. Hens roost any place on the strips, and no separate perch is needed. Pits do not have to be cleaned oftener than three times a year. They do not decrease the capacity of the house.

Large Rooms are an absolute requirement in labor saving; 24 ft. sq. with its 150 Reds or Rocks is the minimum for efficiency. Rooms 30 by 30 ft. in size, housing 250, have a slight additional advantage. Occasionally rooms up to 40 by 40 ft. are used. They are satisfactory, but when the size reaches 24 by 24 ft., from then on, the advantage gained from the larger rooms is slight. Partitions that once divided buildings into small rooms can be taken out with an improvement in working conditions.

Running Water is very important in labor saving, but because

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of the materials required, it is probably something for the future in most houses now without it. Here are important points to consider when water is put in a house, (1) a system that does not freeze, (2) an overflow and drain that does not clog or freeze, (3) a drinking system from which hens cannot throw much water.

Built-Up Litter. It is an unnecessary waste of time and litter to clean houses and renew litter more than once a year. The plan that follows will give built-up litter that stays dry in any climate.

1. Clean and disinfect the house before the new pullets are housed. Paint the nests and roosts with one of the good mite paints.

2. Start with 2 or 3 inches of new litter when pullets are housed.

3. Add to this litter twice a month, building it up to 5 or 6 inches by December 1, or January 1.

4. Turn the litter with a shovel or fork as needed, replacing the material around the waterer if it is wet.

5. Do not let the litter become thin in front of the house and pile up in the back. Use a 6-inch board midway of the pen to prevent this if it is necessary.

6. Feed some grain daily, though it be limited, in the litter to encourage scratching.

7. When pullets are housed as late in the fall as November 15 or December 1, litter is most likely to offer a problem from dampness. It does not have a chance to become broken up sufficiently to absorb moisture. Some poultrymen have handled this by using litter from the brooder house provided no disease had been experienced. The house is cleaned as usual and the roosts are painted as described above.

Handy Feed Rooms. Feed room planning is an individual problem. Carrying up a flight of stairs should be avoided. In long houses, central feed rooms are a good thing, but up to 100 ft., end rooms work out satisfactorily. In multi-story buildings, the slope of the land can often be used to advantage in unloading feed on the various floors.

Feed carriers in long houses are fine, but are practically out for the duration. Elevators are expensive and far less desirable than unloading feed on the various floors of a building.

It is not idle dreaming to think and plan for these things. Investments in labor savers should be made conservatively, but the poultry industry will never again be able to support inefficient management.

Big Ears or Big Yields?

Condensed from The Ohio Farmer

E. W. McMunn

DO YOU want to grow show corn or feeding corn? In other words, are you interested primarily in getting big ears or do you want to get instead the largest number of bushels per acre? It is yield per acre that fills the old corn crib, and as D. F. Beard, extension specialist at Ohio State University, points out, "there is probably no single practice that will make a greater immediate increase in yield per acre for Ohio corn than to grow more plants on each acre of land."

Results of a series of tests in Fairfield County show this relationship of stand to corn yield. One group of hybrids there, with 11,820 plants per acre, made an average yield of 92.8 bushels. The same hybrids, with 13,950 plants per acre, boosted average yield per acre to 101.9 bushels. Thus, heavier planting resulted in a gain of nine bushels of corn per acre.

Over in Mercer County, Joseph H. Backs had somewhat similar results in a series of fertilizer tests where a count of plants per acre was made as well. For instance, plots with 9600 to 9900 plants per acre made uniform yields of slightly over 100 bushels of corn. One plot, with only 7540 plants, dropped in yield to 91.8 bushels per acre.

It is true that all of these yields are high and on good land, but Ohio agronomists insist that even on soils with less fertility, rate of planting is generally below the most productive level. They urge a rate of planting 20 to 25 percent higher than the average now used and estimate this increase would yield five to seven more bushels of corn per acre. Here are recommended rates of planting under Ohio conditions for various hybrids:

M AND K HYBRIDS

Expected yield bu.	Number of seeds to plant per hill	Space between seeds in drilled corn
Up to 40	2	20 inches
41 to 60	3	13 inches
61 to 80	4	10 inches
81 to 100	5	8 inches

W, C AND L HYBRIDS

Up to 50	2	20 inches
51 to 75	3	13 inches
76 to 100	4	10 inches

Ohio farmers who feel they have reached their limit in farm production with available manpower may be able by this one simple practice of planting at a

Reprinted by permission from The Ohio Farmer

heavier rate, to increase their corn yield by as much as five to 10 percent! If you are farming all the land you can handle, it may still be possible to increase production by doing a better job on the same number of acres.

Ohio corn growers have recorded a phenomenal increase in average production per acre with the coming of corn hybrids. Acceptance of hybrids has been so general that for the year just past, better than 90 percent of the state's corn acreage had a hybrid growing on it. But extension agronomists estimate that total corn yield for Ohio would be boosted an additional 3,850,000 bushels if the open pollinated varieties growing on 350,000 acres were replaced by the best adapted hybrids. At the same time, some of the newer and superior hybrids would probably yield an increase of about four bushels per acre if used in place of older and lower yielding hybrids.

Other measures to obtain maximum corn yields would include planting sloping land on the contour to save moisture, soil, power and time. When timothy, soybean straw, corn stalks or nonleguminous residue is turned under for corn, plowing under of a nitrogen fertilizer, such as ammonium nitrate at the rate of 150 pounds or its equivalent is recommended. Increasing the present rate of fertilizing corn to not less than 150 pounds per acre in the hill and 250 pounds per acre in the row will yield a profitable return.

But better cropping methods can be used to obtain greater yields of other crops as well as corn without increase in acreage. For instance—if the 100,000 acres of Ohio soybeans not now being inoculated all received inoculation, yield per acre would probably average three bushels more, making 300,000 more bushels for the state next year. Liming all soils for soybeans as you would for best growth of clover could be expected to make a gain of five to eight bushels of soybeans per acre.

Yearly Crops from Farm Woodlands

Condensed from Better Crops With Plant Food

C. B. Sherman

U. S. Department of Agriculture, Washington, D. C.

USUALLY a farmer thinks of his woodland as a permanent investment. It will give him his fuel and a few fence posts, its edge will shelter the cows; and eventually, but probably not in his lifetime, someone will harvest a 60-year-old crop and leave the land denuded. He doesn't want to see it.

Only recently have farmers come to think of their woodlands somewhat as they do of their fields—as a producing part of the farm, to be considered yearly in farm-management plans, and to be cropped judiciously for an annual small income that will not drain the forest, nor shorten its life, nor ruin its appearance. In fact, it may be just the opposite on all three counts.

In upstate New York in Otsego County, they are learning how to do just this thing. They are gradually fitting the woods work into the seasons when they or their hands might not have enough to do to make the best use of their time, and they find that they can do this work efficiently and with profit.

Long ago the forests were the chief source of cash to the settlers around Cooperstown, but with the well-known evolving economy of an agricultural area, they had ceased to bring the farmers money from year to year. During the depression these farmers were hard put to it, and their anxious thoughts turned toward the woods as they groped for a way out of their dilemma.

In 1935, with a Congressional appropriation the Forest Service set up at Cooperstown a substation of the Northeastern Forest Experiment Station. It was to establish the technical basis for a cooperative forest-management and forest-use program for the farm woodlands thereabouts as a demonstration of possibilities.

To do their part, the citizens then organized the Otsego Forest Products Cooperative Association, and the F.S.A. granted it a loan to build and operate a small modern processing plant. The Association now has more than 600 members; the plant is finished and operating.

Members are now out to

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achieve their purposes—to encourage better care and increased productivity of the woodlands and the orderly and efficient marketing of the products through cooperation, to eliminate speculation and waste, and to stabilize the marketing of their forest products.

By combining comparatively small quantities of forest materials from the farms the Cooperative will accumulate a volume that will allow efficient manufacturing and marketing. The Forest Service, while doing other vigorous educational work, has so far done the actual timber selection.

Next, the farm part of the enterprise had to be integrated with the other farm work in such a way that the usual dairying, poultry, and small-crop farming wouldn't suffer—nor the farm workers either. Fortunately the woods are not so perishable as most crops and do not demand attention on any one month, week, day, or hour, though of course seasons must be observed and market conditions may vary. Much of the woods work can be done in late fall and winter.

Then the woods must be protected better than in the past—protected from grazing animals, disease, insects, and fires. This may mean some expense, especially for fences. Some careful weeding out of undesirable trees and some pruning may be necessary, but that will usually mean some firewood for the house. Later comes the actual work of selectively cutting the crop for annual sale. No more stripped woods and hodgepodge growth of just any kind of trees. Continuous high-value yield is the object.

All the farmers who came into the plan were not versed in felling, sawing, and skidding but these skills are soon re-learned. These farmers have found that, if they use skill and good judgment, they can get several dollars more per thousand feet of logs when working trees into logs of different lengths and grades. Ordinary farm equipment is usually adequate.

Fitting the work into the farm schemes is likely to involve shifts in rotations that must be carefully considered. It is not a matter for haste. Some of these farmers need credit in order to withstand the necessity for selling off the whole woods to some itinerant sawmill or to make the necessary changes in their farm plans. Others haven't the labor it would take.

But hundreds are working into the plan. Recently the Department of Agriculture studied 90 farms on which such shifts are underway. To make a long story short, the cash receipts from the woodlands, mostly from the sale

of sawlogs and fuel, and from off-the-farm work in the woods industry amounted to $170 per farm, or about 5 per cent of the total income from the farm.

Sawlogs brought more than 80 per cent of these receipts. Under present good management and growth conditions the sawlog cut is a yearly removal not much above the annual growth of merchantable woods on these farms. In fact, the quality and growth rate of the stand that remains will probably increase. If the acreage of the woods can be increased the potential returns will be still higher.

Breaking that woods income down, it was evident that farmers who had from 20 to 50 acres of merchantable timber in average condition or better got about $250 each from the woods crop without cutting any more heavily than the average. Those with this acreage of woods in poor shape realized only $15 each. Those having 10 acres or less of merchantable timber averaged $137 each from their woods. The largest amount received by any one farmer from his woods was $770. This income represented some accumulation of woodland growth as the tracts usually had not been cropped for a few years.

These farmers are, of course, fortunate in having a steady outlet for small quantities. Even so, many farmers in the community are not taking advantage of it. But enough have been giving the farm-forestry idea a real trial to make evident that with care, foresight, and some expert farm and forestry advice many farmers in our northeastern States could get a steady income from their woodlots.

The Department is now making somewhat similar studies of the possibilities in parts of the Southern Appalachians. War increases the prospects there for farm-forestry developments at the same time that it is offering the wood-working industries, that frequently employ farm people, a chance to expand.

Grass a Perfect Feed

Condensed from The Jersey Bulletin

R. H. Lush

RESEARCH has shown that the quality and quantity of feeds depend largely upon the soil. Likewise some of the vitamin content of milk depends upon the feed. Winter milk, produced entirely on dry feed of poor quality, may contain only one-fifth to one-seventh as much vitamin A, and less of vitamin D, than that produced by cows on good pasture. Consumers want milk produced not only under the present high standards of inspection but with the maximum of food value at moderate cost. For contented cows and customers alike, this means greater use of pasture and pasture crops.

Fortunately pasture is the cheapest as well as the most nutritious feed that can be grown. Indiana farm figures show that it cost only one-fifth as much to produce nutrients in the form of pasture as by growing other crops. This is an item of greatest importance in the present labor shortage. It takes some planning ahead and a little money for feed and fertilizer to produce more pasture, but there are no harvesting, transportation, or storage charges. Cows do the harvesting and, in addition, return manure to land that often needs additional fertility. Few farmers have too much pasture. Surplus can be used for reserve grazing, hay, grass silage, or to maintain gains in soil fertility. When pastures are well managed there is no waste from surplus growth.

Grass is called a perfect food. Very tender grass contains 23 times as much vitamin A as carrots, 22 times as much vitamin B-2 as lettuce, 9 times as much B-1 as green leafy vegetables, and 14 times as much C as tomatoes and citrus fruit. All pastures do not have the nutritive value described above. Legumes in general contain more calcium and protein and are considered of higher value for feeding than grasses. But recent reports show that the same variety of legume grown on different soils may give different results when fed. At the Tennessee Experiment Station, red clover grown on fertile soil gave nearly twice the rate of gain in calves as red clover grown on

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infertile soil. Grasses grown on fertile soils may have higher feeding value per unit of dry matter than even legumes raised on poor land.

Good grass is especially valuable for reproduction in cattle; Wisconsin data show that bulls should be fed fresh grass or its equivalent. In Georgia, cows on permanent clover pastures treated with limestone and phosphate produced a 100 per cent calf crop. Only 50 per cent of the cows on native unfertilized pasture produced calves.

A seven-year average in Ohio shows 269 pounds of additional beef, or 2,150 pounds of milk, or three times as many sheep days pasture per acre, for 500 pounds of fertilizer. At Urbana, Ill., fertilized bluegrass was grazed more heavily, especially in midsummer, indicating greater palatability than unimproved pasture. The increased protein content of the fertilized grass increased milk yields and decreased the amounts of supplemental protein feed.

What can a farmer do to grow healthier grass now? The first step is to feed the soil. This means the use of lime if necessary, and a grade of fertilizer recommended by the state college of agriculture. In war times, earlier and heavier applications may be advisable on pastures, especially where the acreage is limited per animal.

More legumes should be planted for grazing, ensiling, hay, or turning under; more clover and grass pastures started; and more cereals seeded for late fall and early spring grazing. In 1942, 172 of 400 Indiana dairy farms studied were using alfalfa or alfalfa mixtures as pasture successfully. A recent survey in the same state showed that cereal pastures were valued at $25 to $100 per dairy farm in barn feeding saved. If the extra nutritive value of the milk and health of the herd were considered, the cereal grazing is even more valuable than the figures indicate. Every day's extra grazing in the fall or spring not only cuts down on barn feed and labor but conserves the cow's limited store of vitamins, minerals, and protein.

Well-made silage of any kind, but particularly that of grasses and legumes, help uniform production of nutritious milk in winter. Poor quality of material going into the silo makes poor winter feed.

Mowing pastures for weed control and to increase palatability is important. Excess grass cut off is not wasted but often eaten by grazing animals. Close grazing, either continued or at intervals, is important for the preservation of white clover, maintenance of a dense leafy growth, and to suppress weeds, but it is not recommended in fall. Grasses must have time to recover from sum-

mer, make root growth, and store good reserves enough to make an early start next spring.

One of the chief advantages, aside from even feed production and milk flow, for rotational and supplementary grazing is the opportunity it gives for more uniform distribution and utilization of manure. Dragging to scatter manure after grazing down will make more uniform pasture. Manure should be conserved, pastures maintained in a high state of fertility, and cropping plans made for as many days' grazing as possible if milk is to retain its rightful place as the most perfect food.

Top-Dressing Improves Seedings

Success in obtaining good stands of meadow seedings in wheat will be increased considerably by top-dressing the wheat with manure in the winter before the forage-crop seed is sown in the spring, according to results at the Ohio Experiment Station. A light application of four to six tons per acre is all that is needed. It should be spread evenly.

L. E. Thatcher of the agronomy department at Wooster describes one set of tests in which the crop residues and manure are used in different ways in a four-year rotation of corn, soybean hay, wheat, and mixed alfalfa-clover-timothy hay. The yield records for 15 years show an average of about two tons of mixed hay per acre when all the manure is plowed down for corn. Where the manure was one-half plowed down for corn and one-half disked into the seedbed for wheat, the mixed hay yields were 2.2 tons per acre, and when one-half the manure was used as a winter mulch on wheat the hay yields averaged almost 2.5 tons per acre.

Results of this experiment as well as several others, show that dividing the manure between the corn and the wheat does not reduce the yield of the corn in the rotation. One reason for this is that the better hay crop means a better sod crop to plow under for corn. In the experiment cited above, yields of corn under the three methods were practically identical at a little over 70 bushels per acre.

—Ohio Farmer

Problems of the Soil

Condensed from New Jersey Agriculture

OUT of the soil, the microbes living in it, the rain falling on it, and the air permeating and blanketing it, come the materials that go into the making of the food, clothing, and a large part of the shelter of the peoples of the earth.

Gradually our fund of information about soils is being enlarged. There are new methods by which soils are studied, horizon (layer) by horizon from top to bottom. We now know not only the thickness of these several horizons but have detailed information as to their stores of lime, their contents of nitrogen and organic matter, their tendencies to fix phosphates, and their capacities to supply potash. Field, cylinder, greenhouse, and laboratory tests are being made to learn how the several systems of soil management must be modified to fit the needs of crops when grown on the various soil types. Each new discovery is being built on the solid foundation of past findings. Thus it is seldom that spectacular developments in soil science occur during any one year, but the net result of nearly a century of study is an enormous body of facts on which better management practices are being confidently built.

The soil is such a hodge-podge of minerals and organic matter and contains so many different elements that it is not a very satisfactory medium for growing plants in an experimental program designed to find out exactly what soil elements these plants require. The question is, just what do plants need from the soil, and how much? To answer these questions, a great deal of pioneering work has been done in which a variety of plants, growing in pure white sand, have been supplied with nutrient solutions carrying all the elements known to be required. From such studies it was quickly learned that plants had to be supplied not only with the usual lime and fertilizer elements but with small amounts of boron, manganese, and zinc as well, and that special efforts had to be taken to see that no deficiencies of iron occurred.

Soils may become poisoned for plants as a result of accumulations of lead, arsenic, copper, boron, and similar elements. These elements may have reached the soil by way of smelter dusts,

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drainage and irrigation waters, or sprays, or, as in the case of boron, they may have been applied directly to the soil for fertilizing purposes. The recent scare about eating vegetables from soils that had been treated with lead arsenate for Japanese beetle control failed to take into account the fact that the plants themselves would have been killed if any large amount of this poison had been absorbed by them. Thus it is often difficult to get replants to grow in an old orchard or to establish a new orchard where an old one has been located, because of the spray residues remaining in the soil. When soil has become poisoned, the practical approach to the solution of the problem has been found in deep plowing, liberal liming, making large additions of organic matter, and draining any wet spots in the area.

Compact layers of soil are sometimes found just below plow depth and at other times much deeper in the soil. Such layers interfere with the movement of air and water with resulting bad effects on the crop. Recently it has been shown that the answer to such a situation lies in breaking up the subsoil by the use of a chisel and dropping a mixture of lime and gypsum or superphosphate into the opening. A number of field ponds have entirely disappeared following the application of this system after the surface water had evaporated during the latter part of the summer.

One can test the soil, apply fertilizer in conformity with the results, and then check the tissues of the plant to find out whether the fertilizer has been delivered to it. Such tissue tests, showing marked color changes in the presence of nitrates, phosphoric acid, and potash, are being used to determine why many fields of alfalfa tend to die out after only a few years of harvesting. Of 18 fields under study, none of which had been seeded earlier than 1939, only 7 remained at the end of the 1943 crop season. Tests of the plants on the 11 fields that had failed revealed that the alfalfa of 3 of them apparently had died for lack of potash. Of the other 8, 1 died because of wilt, and 7 by reason of winter-killing. Of the remaining fields, the tissues of the plants in 2 of them are now deficient in potash, indicating that the crops will fail before another year has passed unless potash is applied.

The development of an increasing number of cases of dwarfed alfalfa, brown-flecked turnips, and rusty-stemmed celery raised the question as to whether there might not be a deficiency of boron in some of the soils on which these crops were being grown. A careful study proved that this assumption was

correct, and indicated that unless the plow depth of each acre of soil contains around 12 ounces of available boron, it will not produce satisfactory yields of these and many other crops. Examination of representative samples of 20 of the most important soil types of New Jersey showed that 7 of these soils contained less than that quantity of boron. Field studies on 450 farms of the State revealed that at least a portion of the land on over 12 per cent of them was in need of boron. It was found that the use of 20 pounds of borax (containing 11 per cent boron) per acre, applied broadcast and worked into the soil before planting the crop, would overcome the deficiency and greatly improve the crop. Thus the average acre-yield of alfalfa on 4 boron-deficient soils in South Jersey was raised from 3,820 to 5,150 pounds for the first two crops of the 1943 season, an increase of 1,330 pounds of hay. The cost of the 20-pound application of borax was around $1. It was found necessary to reduce the rate of application to about 10 pounds per acre on sandy soils. For such crops as beans, which are very susceptible to injury from borax, a 5-pound rate of application is advised.

The handwriting of erosion is gradually being erased on the farms of New Jersey. Fortified by the facts that are being uncovered by the Agricultural Experiment Station, and by the Soil Conservation Service at the Marlboro research farm, specialists in erosion control are aiding farmers in the application of improved practices to large acreages of land in the State. As a result, much more of the rain now soaks into the soil where it falls than formerly, and the downhill movement of the soil is being greatly reduced.

For example, the grain binder couldn't be driven across the gullies on the farm of Ellis Komisar and his sons near Ringoes until these gullies had been bridged with fence rails. The lower fields, down by the brook, were doing well, since they were being reenforced, year after year, with the topsoil that was being washed off the slopes. But the farm as a whole was going backward until some 7 years ago when the Komisars started to farm on the contour, using a few diversion terraces to carry off the excess water during hard rains. Today, the crops are growing just as well on the top fields as they are down in the valley, and yields on both levels are improving every year.

Up at Closter, Milton Breisacher had a field he was about to abandon because the land was down to the subsoil in many places and crop yields were not high enough to pay the labor costs. After talking the problem over with the county agent, how-

ever, Breisacher agreed to give contour farming and cover cropping a trial. The results were so satisfactory on that field, and the rate of recovery in the productive power of the soil was so rapid, that Breisacher soon decided to apply a similar soil-saving system to his whole farm.

Putting Fertilizer in Its Place

The potato grower's planter places the fertilizer just about where he wants it—a little to each side and a little below the level of the seed pieces. But the problem of placement has not been so well solved on many of the other crops, or on other types of soil than those used for potatoes. If the corn grower wants to use more than the 200 pounds of fertilizer which his planter will apply along the row, where should he place it? If the tomato grower wishes to supplement the starter solution that is fed out of the planter-barrel at transplanting time, will he broadcast it, mark the field out and place the fertilizer where the rows are to be, or apply it at some other time or place?

Two years' results with a 5-10-10 fertilizer on corn, on Sassafras loam soil, favored placing the extra fertilizer in the seedbed with a disc drill, in bands 3 to 4 inches deep and 7 inches apart, rather than applying it broadcast, on top of the soil, either before or after plowing, or dropping it on the bottom of the furrow at plowing time. Broadcasting the same grade of fertilizer before plowing—fall or spring—gave slightly better yields of tomatoes than broadcasting after plowing. Dividing 1,000 pounds of such a fertilizer into 100-pound lots, and applying one of these every two weeks from September to November and from April to June, produced several times as much Ladino clover, on Lakewood sand, as was obtained by applying all the fertilizer broadcast over the seedbed and working it into the soil before planting. Liquid side-dressings of 200 pounds of 6-24-24 fertilizer produced greater increases of sweet potatoes, on Keyport sandy loam, than the best placement (plowing it under in preparation for planting) of twice that amount of the same fertilizer applied dry.

Farmer Can Grind Corn for Hog Feed

In feeding pigs, it will not pay a farmer to have his corn ground at a commercial mill but, if he has his own hammer mill, he can grind it to advantage, says F. H. Smith, animal nutritionist with the State College Experiment Station.

Recent tests have shown that grinding gave a better utilization of corn, with about 15 per cent less feed being required to give 100 pounds of gain.

"Medium-fine grinding of corn gives better results than finely ground. A gritty-feeling product is superior," Smith says.

He points out that wheat, barley, rye, and other such feeds should be ground because the hog does not crush the small grains with his teeth as readily as the larger grains. Also, the animal is unable to use the food values of the whole grain because the hard outer layers protect it from the digestive juices as it passes through the digestive tract.

"A three-sixteenths inch screen in a hammer mill will give the correct fineness in grinding corn," Smith says.

—Hog Breeder

Hog Pastures

In rating pastures in and around the Corn Belt, Dr. Bohstedt, of the University of Wisconsin, classed as "excellent" pastures, alfalfa and red clover which may be grown in combination with grasses, and Dwarf Essex rape which may be grown with oats or other cereals and which may also include Canadian field peas. As "good pastures during relatively short seasons of growth, he named Sudan grass, soybeans, oats-and-peas, rye and for spring and fall pastures, bluegrass. Classified as "fair to poor" are midsummer grass, other drought susceptible grasses, and sweet clover.

The quality and efficiency of each of these pastures is largely determined by such factors as weather, soil and soil fertility, he brought out.

—Hog Breeder

$3,000,000 Industry in Texas' Broiler Capital

Condensed from Farm and Ranch

Mrs. Y. W. Holmes

WHEN is a chicken not a broiler?" "When it's over 2½ pounds." That's the answer you'll get in Smiley, Texas' broiler capital. With a population of 300, $3,000,000 worth of business was transacted there in 1942, and broilers brought 95 per cent.

Smiley neighbors used to have the poorest credit standing in Gonzales county. "Stuck knee deep in that worthless sand," a banker exclaimed, "they are always behind."

But "White Leghorn" Bell saw the light, quick-drying soil as Nature's gift to poultry raisers. In the middle '20's he installed for Smiley's use a "Little Blue Hen" incubator. Pioneer Lloyd Bell is now Gonzales county's largest producer, operating at Smiley poultry and egg farms, a dressing plant, and a 360,000-capacity hatchery, besides financing millions of broilers.

In 1929, with business already feeling the depression, Tom Manford, Smiley merchant, stockman and cotton farmer, opened his hatchery. Bell, Manford and a few others able to guarantee financing said in effect to the down-and-out farmers:

"You raise broilers; we'll back you. You don't have to give mortgages or notes on this crop. It's a short-term proposition, not the long-term gamble you're used to on cotton and cattle. In 90 days we'll know whether you've succeeded or failed. If you have a wholesale death loss, we'll stock you for another batch. We'll furnish you chicks, feed, equipment, medicine, advice, trucking, shipping coops and men to pick them up."

The industry thus began developing at Smiley along the same lines now so effective throughout the Gonzales area.

The efficient succeeded beyond their hopes. Few failed to make a moderate living. Nobody is on Federal relief in Smiley.

An amazed extension expert once exclaimed, "They just can't do all they are doing; still, they do!" With antiseptic, sand-soil floors and ready-made runways, ideal climate and altitude, Smiley operators admit that Mother Nature tempts them to easy-going habits. Yet all agree it pays divi-

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dends to assist her by following approved practice in sanitation, feeding and keeping records.

Their 500- and 1,000-capacity houses measure 14 by 16 and 14 by 32 feet. The soil litter is freshened only between chick placements.

Many full-time raisers of the favored Red and White Light Cross take off 25,000 1¾- to 2½-pound broilers three times yearly on 2-acre places. One experienced worker, giving full time, successfully handles three bunches of 10,000 to 12,000 yearly.

Today, the economic structure of Gonzales county is built around poultry. Twenty million pounds of live broilers were shipped in 1942, mainly to Texas markets. Its hatcheries handle 1,000,000 eggs every three weeks. Leading Texas in turkey production, it has at Gonzales the state's largest dressing plant, handling in season 10,000 turkeys daily. Three egg-breaking plants afford average disposal daily of 600 cases at season's peak.

It was the broiler, efficient medium of food production, furnishing the most chicken for least pounds of feed, that set the Smiley record, and pointed the way to county success in other poultry lines.

Each of the 20 or more hatcheries, ranging from 40,000 to 360,000 capacity, has its clientele of raisers using the complete financing plan. Prices and service charges appear high to one accustomed to paying cash and assuming personal responsibility for production risks and marketing, but here the plan is universally used and preferred.

For example, L. H. Chessher, a smaller operator, offers 50,000 hatchery capacity at Nixon, 8 miles from Smiley. He finances 300,000 broilers. Contracting with egg farms, he furnishes breeding roosters and provides for egg collection. He not only furnishes feed and fuel, but in some cases pays electric bills and advances money for labor and incidentals. By merely verbal agreements, his producers promise to sell to him or get his permission to sell elsewhere.

Eggs for Manford's 130,000-capacity hatchery come mostly from his breeding flock of 10,000 White Leghorn hens and Red cockerels. Besides his own production, he finances 2,000,000 broilers.

These hatchery men all sell feed and complete poultry supplies. Many mix their own brands. Theirs is more than a patriotic responsibility to see that their prescribed balanced ration produces maximum results.

The set-up provides for plenty of free enterprise, but suffers little or no competition from concerns outside the area.

Under the system's advantages,

part-time raisers on regular farms and many townspeople find broiler production profitable.

While attending Nixon high school, and helping on his father's 330-acre farm, Vernon Patteson, with four 90-day broiler productions, covered all investment cost and cleared $683.

First converting a shed, he placed 404 two-day-old chicks. Losing 22, his cost at twelve weeks was $95. The 382, weighing 899 pounds, brought $178.30 —$83 profit. Patteson then built a 2,500-capacity house 16 by 64, equipped with wall feeders, different-sized troughs, automatic fountains, and bisected with a 4-foot feed storage room, for $605. His objective was a 2½-pound cross in 12 weeks, counting 10 pounds of feed per bird. His records follow:

Placed	Expense	Pounds	Sale	Profit
2400	$712.21	4682	$ 985.98	$273.77
2000	680.00	4164	1005.66	325.60
2300	907.00	4760	1523.20	616.13

Like other industries, this one is contending with labor shortage and perplexing problems. Prices on the 7 pounds of mash and 3 pounds of grain required to produce a broiler have rocketed. Feed must now be figured on a day-to-day basis, perhaps at a great increase before chicks are marketable.

Price ceiling distinction between broilers and fryers is of real concern in this area. To insure the reasonable margin of profit, its popular market weights must continue from 1¾ to 2½ pounds.

Transportation difficulties are forcing operational changes. Cafes and housewives alike have preferred live birds. New dressing plants have opened at Nixon, Smiley and Gonzales. "But these," as producer Chessher points out, "are ventures. After rationing, will the Texas broiler markets have become permanently cold-storage minded?"

Veteran producer Tom Manford says, "These problems are like an enemy's new weapons. We must meet them by increased efficiency and safe adaptation to new developments. This broiler business began in a depression. No outside capital is represented; profits are reinvested in the home area. As in its beginning, it will continue helping neighbors help themselves."

The Farmer Must "Mobilize" the Soil

Condensed from The Weekly Kansas City Star

William A. Albrecht

Chairman, Department of Soils, Missouri College of Agriculture

FOOD is fabricated soil fertility. But before the plants can synthesize it into nutritious vegetation the soil fertility must be liberally mobilized (put in state of readiness), both in kind and in quantity. It must be held on reserve against leaching but be mobilized into the plants to make the crop. In the last analysis, if food is to win the war, it is the soil fertility that must be the victor.

Early plowing as is extensively practiced for fall-seeded cereals, like wheat, barley and rye, is beneficial because it permits soil activities that mobilize the fertility. Vegetable matter turned under is decayed. Its excessive carbon is burned out. Its nitrogen is changed into more active forms. Time is given for the mineral nutrients to move from the reserves in the silt crystals to the clay which is the seat of rapid plant nourishing activities. Benefits of early plowing are conferred possibly more through aids to soil fertility than through moisture additions. This practice is a case of removing weeds and eliminating drain on the fertility so that the soil can stock this for rapid delivery to the following crop:

Where in the soil is the fertility reserve held? How much of the soil really goes to make a crop? These are questions that may well be asked. The soil contributes the ash. This is about 5 per cent by dry weight of forages, for example. It is usually higher than this in those recognized as more nutritious feeds. Not all of the ash serves necessarily in plant or even animal nutrition as we now understand it. On soils of lower fertility the crops that are less nutritious as feeds carry more silica in their ash. Silica is a rock constituent that contributes no nourishment.

The plant ash contains about a dozen different chemical elements, a shortage of any one of which means less vegetative growth and less plant activity to be registered as seed or grains. The balance of the plant, or about 95 per cent, is contributed by the air and rainfall. Here, in what is largely the

Reprinted from The Weekly Kansas City Star, Sept. 1, 1943, Kansas City, Missouri

weather, are the sources of the great bulk, or the woodiness, of most crops.

When air and water are so free-flowing, one can readily expect plenty of these everywhere. For this reason plant growth as bulk, or woodiness, is common. The 5 per cent that come from the soil, however, represents about a dozen fixed elements. They do not flow about in the soil. They are not readily water soluble. The root must go after them and enter into a barter to get them by exchange from the colloidal clay or humus part of the soil.

It is there that the plant must find ample amounts and readily exchangeable forms of its nutrients if it is to do much food-fabricating business during the growing season. As soil managers, it is our business to mobilize the fertility on to the clay which is a kind of a jobber to pass it from the silt and sand minerals to the plant roots. Herein we are making the quality part of the crop as grains more than merely straws and stovers, with their disappointments in nutritional service.

When nature gave the pioneer the virgin soils, the clay and the humus carried generous supplies of exchangeable nutrients for plants. The silt and sand mineral fractions, by their own breakdown, were slowly delivering some to the clay. Even though this delivery of fertility by the mineral crystal part of the soil was slow, the humus, too, was breaking down to supplement the supply going from the mineral to the clay and then to the plant roots. Humus and clay were both serving as exchangers or jobbers of what they got from the mineral decomposition. In addition, the humus was throwing itself in for good measure to add what had been in proper combination as preceding plant generations.

It was this double breakdown, first, of the mineral reserve going on slowly, and second, of the humus or organic matter going on rather rapidly, that was keeping up the march of exchangeable plant nourishments from the soil to the plant production front. Here was the basis for our big crops.

Unfortunately, the organic matter supply has now been significantly reduced in many soils. Excessive tillage has fanned the microbial fires to burn out the humus. One of the sources of fertility supply has just about been removed. At the same time there has been taken out one of the jobbers, that is the colloidal humus that was passing nourishment from the silt and sand minerals to the plants. Our soils are now mobilizing their fertility almost solely through the exchanging activities of the clay from the silt mineral reserves.

Sanborn Field of the Missouri

Agricultural Experiment station is telling the story of fertility mobilization, too late and too little, on its classical plot No. 9. This plot has been in wheat continuously since 1888 with annual removal of the entire crop. During the early history the wheat yields declined gradually as a general average. During recent years this plot has been a cripple —limping badly in its mobilization of plant food—with a crop only in alternating years; first a crop and then a crop failure.

Failure of soil fertility to be mobilized rapidly enough for annual cropping is well illustrated here. Now that the organic matter is so nearly gone from this soil, there is nothing to be given to the plant roots by chemical breakdown of either the clay or the humus. The clay offers no nutriments except as they are given by, or taken from, some other source. The silt and sand minerals are the only source. Acidity from the crop roots is taken by the clay in trade for what it can give to the crop. This acidity is then passed to the silt minerals to break these down all too slowly and to pass their limited offerings in the opposite direction through the clay to the plant roots.

The rate at which this process of exchange is going — even though it is running winter and summer—is too slow to make an annual wheat crop. After a crop has taken its helping from the clay to exhaust this by the time of the wheat harvest in late June, there isn't enough fertility mobilized between then and the time to germinate and start the next seeding in October. The soil then takes a year of "rest" on its own accord. In consequence of the "resting" of this soil where even few weeds will grow, enough fertility is mobilized from the minerals to the clay again to give a modest crop in the alternate year.

Other illustrations of this slower rate of fertility mobilization in our soils are becoming more common. Continuous cropping to combinations of cereals and legumes exhibits this trouble by distributed yields. "Oats-lespedeza," in which the oats are seeded in the spring, "is the best forage combination among these," according to the department of field crops. The soil's rest period of the winter ahead of the oat seeding permits a slow mobilization of the fertility on to the clay for rapid delivery to the oat plants in the spring. This rest period is more effective if the dead lespedeza is disked into the soil the preceding autumn after the first frost, according to the farmer experience report by County Agent Virgil Burk.

Fertility is concerned in this part decay during the winter. If not so disked the introduction in the spring gives a competition

with the oats for soil nutrients by the bacteria as forms of small plants rotting the woody lespedeza remnants, that outstrips the oats in the struggle.

Fertilizers are helps in pushing up the soil's producing power. Now when not only the cereal grain crop, but fall and early winter grazing are so valuable, extensive use of commercial plant food is to be recommended. Fertilizers are available except with some limitations.

If food is to be amply provided, soil fertility must be mobilized by every means within the soil and by every supplement such as manures and fertilizers from without. The crop-producing power must be geared into production of real food values that depend more on what is fabricated from the soil fertility than from fresh air and water, or from the weather. Our soils as well as all other wartime forces must be mobilized judiciously by wise management of, and contributions to, their soil fertility.

Now of all times, we can ill-afford to allow our soils to continue in a crippled condition—impoverished, faltering, taking two years to mobilize the plant food needed so badly every year.

Milk from Barren Cows

Each year a considerable amount of feed is wasted when dairy heifers prove unable to conceive. With the feed situation as it is today, it is unfortunate that feed is used to raise heifers that will never produce milk. For these reasons, it seemed desirable to determine the possibility of inducing and maintaining lactation by hormone injections.

A 30-month-old Holstein heifer that had proved barren received injections over an 11-week period. In 228 days this heifer produced 4,791 pounds of milk with an average fat test of 3.8 per cent. The peak daily production was 27.5 pounds.

A 33-month-old Jersey heifer, also barren, was treated for 14 weeks. Gradually she came into milk production. In 305 days she produced 8,045 pounds of milk with a total of 382 pounds of butterfat, making her average fat test 4.7 per cent.

—*New Jersey Agriculture*

Call for C. F.

Harry Rauch

WHEN Farmer Jones lays down his plow to take up a gun, down South Jersey way, the one thing Ma Jones doesn't worry about is who will take care of the crops. "Call up C. F.," she says. "He'll take care of it." C. F.'s taken care of at least 100 such emergencies.

Right now there are more than a dozen little C. F.'s, namesakes of the big man himself, romping around the 30,000 acres of rich farmlands which make up Seabrook Farms. But even the two-year-olds know which C. F. takes care of everything. He is C. F. Seabrook, owner and operator of the largest mechanized industrial farm in the U. S. A., colossus of agriculture sprawled all over southern New Jersey, equalled in size only by the vast communal farms of the Soviet Union.

Sixty-three-year-old C. F. isn't always around his immense property to take care of his calls. But he's always available. There was the time he was in Utah. The steam plant wouldn't function. Thousands of hands were idle. Trucks were lined up, unable to unload. A call was put through to Utah. After thinking a moment, C. F. said: "Back up a couple of locomotives and hook them up to the pipes. That'll work." It did. It was that easy, but only C. F. could have thought of it.

Tired of trying to beat the farmer's nemesis, old man weather, C. F. sold the farm in 1927 to devote himself to building roads, a little trick he had learned during his spare time. Having been New Jersey's state highway commissioner a few years before, he accepted a personal call from Stalin to come to Russia to modernize its highway system. Even there he couldn't escape from business. Things were not going well back home. They burned up the wires to reach him. He headed for the States and bought Seabrook Farms back.

The farm's 30,000 acres started out as sixty acres of land cleared by C. F.'s father at Deerfield, New Jersey, back in the eighties. The growth was a gradual but steady process, with an assembly line motif, dreamed up by the son. The Henry Ford of the farm world, C. F. resembles Ford in face and figure, and thinks like Ford when it comes to mass production.

Seabrook Farms' dehydration plant keeps close to 7,000 men and women, plus 500 contract farmers working their own lands, scurrying about during the height of the farming season. They pro-

duce 200 million pounds of field-fresh foods every twenty-four hours. This huge supply of edibles is divided between the armed forces and the Birds Eye frozen foods industry.

In the old days, when sixty acres looked like the world to young C. F., he used to drive his father's team of horses, straining under the load of fresh produce, forty miles to the Philadelphia market. There was plenty of time to ruminate. And plenty of time for the sun to get in a few knock-out licks on the perishables in the wagon. What the sun started, the oft-times overstocked market in Philadelphia finished, as far as profits were concerned.

Even then C. F. had some ideas about doing something to beat these two bogies. The answer, he knew, lay somewhere in preserving the highly perishables. But he hadn't quite figured it out yet. Figuring things out was a start-from-scratch proposition with the lad. Once he learned to read and write, he quit school in the third grade, trusting the soil to teach him the rest.

He began to experiment on his own in the art of raising prime vegetables. By the time he was twenty-two years old, all of his father's land was sprouting the best peas, apples, turnips, potatoes and what-have-yous ever grown. He decided the time had come to expand.

Off he went to the nearest village with a wagon-load of the best of his best. Parking in front of the bank, he barged into the president's office. "I'd like a loan of $1,000 to buy some land," he announced. Asked for collateral, he invited the banker outside to the curb and showed him his produce. "Here's my reference," he said. He got the money.

Increased holdings increased his farming problems. A harvest season that ended with just enough money to buy more seed and repair worn-out equipment was considered a good one by almost any farmer. But not by C. F. Canning, in the 1900's, was a growing industry. Rather than become beholden to the canners, C. F. built himself a small canning plant on his farm, and it began to prosper in a modest way.

In 1912, when he was thirty-two, C. F. went into partnership with his father. Although canning had solved much of his problem of preserving his crops, it wasn't the final cure-all. That came along twelve years later when Clarence Birdseye, a young scientist out of Gloucester, Massachusetts, developed his quick-freezing process.

The farmer and scientist got together, and the combination paid off in dazzling dividends. Demand for their quick-frozen foods soon outstripped production, and continued to top it for

several years until C. F. built an ultra-modern quick-freezing plant that now turns out millions of pounds of field-fresh foods every day in the week.

Seabrook Farms isn't just a vast expanse of growing crops. Sticking up all over the land are mammoth four-story processing plants operating day and night, an all-brick 20,000,000 pound capacity warehouse, holding the quick-freezing plant, and a gigantic dehydration building, largest in the world. Thanks to the dehydration method of shrinking foods, the Army Quartermaster Corps can now ship as much dehydrated food in one ship as would have required six ships before processing.

Also jutting up here and there among the miles of scientifically cultivated crops are dozens of buildings housing huge fleets of tractors and trucks, airplanes for dusting and spraying, blacksmith and electrical shops, business offices, and a police station. There are new government-built dormitories for 1,750 workers, a company dormitory for 750, a movie house, a two-story school for the children, a library, and a cafeteria in charge of the former maitre d'hotel of the Traymore in Atlantic City.

C. F. beats the no-rain problem with thirteen artesian wells providing life-giving water carried through miles of overhead pipe lines. About 12 million bees take care of pollination, and on the side, pile up honey for marketing.

Running like a train of subway cars is a fleet of 400 trucks which speeds from the fields to the processing plants during the eight month harvesting season. Workers do a three-shift, twenty-four hour job at the season's peak, to the tune of popular music broadcast from a loudspeaker. One free meal a day is thrown in for good measure. During the summer vacation period, students from nearby high schools and colleges earn better than spending money and enjoy a full summer's sojourn at a fine resort hotel bought by C. F. Swimming, roller skating and juke music are added attractions.

Many of the innumerable mechanical thing-um-a-bobs on the farm were designed in C. F.'s fertile brain and put down on blueprints by his engineers. While trying to select the finest of the pea crop for Birds Eye, for instance, C. F. discovered that day-old peas float in a brine solution and the older peas sink. So he had his engineers construct a machine utilizing this observation.

C. F. works along the same lines in getting his permanent help. Those who make the grade as first-class workers stay on and become members of an American Federation of Labor union, a rarity in the farming industry.

Every Christmas they draw a thousand dollar insurance policy plus a hospitalization and health policy. For those who grow old on the job there is a plot of land. C. F. stands ready to purchase the produce. If the old hands become too enfeebled to work the land themselves, he sends help over.

"No man has to go hungry, or lower his pride, when he has a bit of land he can call his own," says C. F.

That all this smacks of the Soviet Farming system, C. F. would be the first to deny. It's pure Americanism, he avers. His two years in the Soviet Union taught him to like many things about the Russians, but what's good for the Russians isn't necessarily good for Americans, according to C. F.

Non-smoking, non-drinking, non-chewing C. F. has three sons, one daughter and four grandchildren, all born and bred on the farm. The oldest son, Captain Belfort Seabrook, is with the U. S. Army Quartermaster Corps and is now teaching his father's farming methods in Australia. He is a vice-president of Seabrook Farms, as are his two brothers, John and Courtney.

These days C. F. can always be found in his experimental greenhouse where he is working on more important things than bigger and better beans. He's trying to cultivate tropical and semi-tropical plants to replace those grown only on lands under Japanese control. If there is a way to bring something new out of American soil and under God's sun, C. F. will do it or know the reason why.

Keep Manures Dry

The nitrogen content of both poultry and rabbit manures can be held at a higher percentage if the material is dried as promptly as possible and stored either in a building or shed in a dry condition until sold. Nitrogenous fertilizers are essential to the war effort and, in the opinion of L. D. Sanborn, assistant farm advisor in Los Angeles County, considerable nitrogen losses can be prevented by proper handling on the farm. In the sale of properly cared for dried material the producer might sell on a nitrogen content basis, thus receiving a premium for high nitrogen content as a result of better preservation methods. He points out that once dried, the nitrogen content is more or less stable and the fly menace is practically eliminated. Materials stored wet should be in flyproof containers or sheds.

—*California Cultivator*

Phenothiazine Mixed with Salt for Sheep

Condensed from Sheep Breeder

HERE is something of great importance to all sheep raisers.

Men in our armed forces need an average of 1 lb. of meat each per day, and we should get it to them. Lamb mutton is used to a much greater extent than ever before and our service men like it. We can increase the supply materially if we get rid of parasites which hinder sheep-raising more than all other diseases combined. The U. S. Bureau of Animal Industry says: "Nodular worm disease accounts for a loss of 100 million pounds of lamb in this country annually. It also causes an estimated loss of 6 million dollars a year from the discarding of parasitized intestines."

One has only to watch sheep-killing operations at packing plants, particularly in the fall and early winter when the bulk of the kill is native stock from farms to fully realize the extent of this loss. It is not unusual to see 75 percent of the sheep intestines discarded as unusable for surgical sutures which are needed for tying up blood vessels and for sewing up wounds. Fortunately, there is relatively little in the northwest quarter of the United States, but the average for the year on all sheep slaughtered is at least 25 per cent unfit for surgical sutures because of the swellings, or knots, in the intestinal wall containing imprisoned worms.

Thanks to the efforts of the U. S. Bureau of Animal Industry, we now have a drug called Phenothiazine which is a most effective agent in removing nodular worms, stomach worms, and other round worms, but not the flat kind, tapeworms, which are much less prevalent. The nicotine treatment is used for these.

The vital need of surgical sutures, called "catgut," made from the nine yards of sheep intestines nearest the stomach, and the marked decrease in our importations of sheep intestines from Australia for this purpose due to war conditions, behooves all of us in this country to get rid of the nodular worms.

While the loss of material for surgical sutures caused by this parasite is large, the slow gains, sickness, and often deaths of sheep on farms, is infinitely greater. Sheep in a more or less advanced stage of nodular worm infection usually scour badly, and get very thin.

Reprinted by permission from the Sheep Breeder, Dec., 1943, Union Stock Yards, Chicago, Illinois

Stomach worms are also very prevalent in sheep, including those in the northwest, and phenothiazine is equally effective for these. The usual procedure in the northern states, where the cold winters kill these parasites on grass, is to treat the breeding flock, giving each one ounce of phenothiazine, perhaps in the form of a drench, after they have been taken from pasture, and again in the spring before they go on pasture. This will remove most of the worms so that the following season the pasture will not become appreciably infested to cause the lambs to become infected.

Recently the U. S. Bureau of Animal Industry, and many of the states, have found that by mixing the phenothiazine in the dry, powdered form with common salt in the proportion of 1 lb. of phenothiazine to 9 lbs. of salt, and kept before the ewes and lambs at all times, will remove a high percentage of these worms. Further investigational work is needed, but the results to date are very promising. In a recent letter from Dr. Benjamin Schwartz, in charge of the Zoological Division of the U. S. Bureau of Animal Industry, he says:

"The phenothiazine-salt mixture, as developed in the course of our investigations, is designed primarily as a summer treatment. During the summer the consumption of salt by sheep is at its height and consequently sizeable amounts of phenothiazine are taken. The consumption of the drug in this manner gradually eliminates the parasites from the ewes and lambs and the traces of phenothiazine in their droppings prevent the larvae from reaching the infective stage. This system of self-medication accomplishes, therefore, a dual purpose, namely, the gradual elimination of the parasites harbored and the prevention to a large extent of the acquisition of parasitic infection. We have maintained a small flock of ewes on the phenothiazine-salt mixture for two years, the medicated salt being available to the animals at all times. By this regime we have practically eliminated nodular worms from our flock."

We also quote from a circular issued in March, 1943, by the U. S. Department of Agriculture on "Some Wartime Measures for Increasing Sheep Production Through Control of Internal Parasites.":

"The mixture should be put in an open container that is sheltered from the weather, and where the sheep have ready access to it. A convenient method is to use small improvised shelters that can be placed in several different parts of a pasture. The medicated salt may be placed in the box-like trough, which forms

the floor of the shelter, if the boards are tight. Ordinarily, there should probably be one container of medicated salt for every 30 or 35 mature sheep. Sufficient quantities of the mixture (about 10 lbs.) are put into the containers to meet the normal requirements of the flock for periods of 2 to 4 weeks, and the supply is replenished at more or less regular intervals.

"It may be found at first that the sheep do not consume the mixture readily. This is usually the case when the sheep are unfamiliar with the locations of the salt or are apprehensive of its phenothiazine content. To overcome this it may be necessary to add to the mixture, from time to time, a few handfuls of grain or other feed to which the animals are accustomed.

"The effect of this kind of medication upon internal parasites is two-fold. First, the rate of pasture contamination drops to insignificance soon after the animals start consuming the drug. The eggs of the gastro-intestinal roundworms which are passed in the feces of medicated sheep do not develop to free-living, infective stages in the pasture. Hence the risk of reinfection is minimized, as are the dangers of permanent pastures. Secondly, the number of internal parasites, as judged by the number of eggs found in the feces and by the number of worms recovered at post-mortem examinations, is reduced markedly after 3 or 4 weeks of medication. Moreover, because the voluntary salt consumption of sheep is greater during the warm months, it follows that there is an increased intake of the drug during precisely those periods when the risks from parasitism are greatest.

"It seems apparent that the method eliminates tedious periodic treatments, achieves a uniform control of parasitic infection, saves time and labor, and eliminates the need of dosing and handling animals individually. It is believed that this kind of medication should serve admirably the needs of sheepraisers in the warmer southern states where sheep graze most of the year and where parasitism is an ever-present problem. In the northern states where the long, hard winters afford considerable natural protection against parasitism, control with phenothiazine and salt is admirably adapted to use during the grazing season. In these areas, this program of medication, namely, phenothiazine and salt during the grazing season, is all that should be required as a program to keep gastro-intestinal parasitism in check."

Poisonous Plants

Condensed from The Southern Planter

J. E. Foster
North Carolina State College

H. H. Biswell
U. S. Forest Service

POISONOUS plants kill many animals every year. The number of losses is greater than many realize, because a large percentage of the deaths from unknown causes are no doubt a result of poisonous plants. To fight this enemy every farmer should try to know (1) the poisonous plants on his place, (2) where they are growing, (3) which parts of the plants contain the poison, (4) what season of the year they are most dangerous, (5) what animals are likely to eat the plants and become poisoned, (6) under what conditions poisoning occurs, and (7) the treatment where one is known.

Of the thousands of wild plants found in North Carolina only about 50 or 60 are poisonous. As few as 10 appear to be really dangerous and are responsible for most of the livestock losses. Some of the 10 dangerous plants are familiar to almost everyone, whereas others are little known. They include white snakeroot, lambkill kalmia, mountain laurel, black cherry, common chokecherry, spotted water-hemlock, Carolina jessamine, yellow buckeye, crow-poison and pink deathcamus.

As a rule cattle and other livestock do not eat poisonous plants even though they may be growing in rather close association with palatable forage. When animals are allowed free choice they usually select the more desirable plants and avoid those that are toxic. This is fortunate, for if poisonous plants were well liked they would cause much more loss than they do.

It is usually under some special condition that poisonous plants are eaten, such as when palatable forage is scarce. This is because hungry animals often feed on whatever is available, including poisonous plants, instead of selecting the better forage. Cattle will often eat white snakeroot, for example, in the fall after the palatable forage has been closely eaten, but usually do not eat it in early summer when good forage is plentiful. Its harmful effects during the fall season no doubt

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accounts for the name "fall-poison" in many localities. Mountain-laurel is seldom eaten except in winter when snow is on the ground and the animals crave something green, or in early spring when herbage is scarce.

Because the farmer can usually do more to prevent poisoning than to cure it, serious attention should be given to this phase of the poisonous plant problem. In many cases, poisoning can be prevented with very little trouble and expense. For example, black cherry and common chokecherry do not cause poisoning except when wilted leaves from cut down trees or broken limbs are eaten. The reason for this is that the poisonous substance is not changed over to a harmful form until the leaves wilt. The wilting leaves produce prussic acid which is one of the most deadly poisons known to man. Black cherry and common chokecherry, therefore, should not be cut in pastures or fields during the grazing season, but should be cut only during the dormant period.

Poisoning can often be prevented by recognizing the trouble and removing the cause. For example, a farmer had been losing a cow or two each year in the early part of August. An examination of the area where the cattle were kept, perhaps 25 acres, showed that broomsedge made up practically all of the summer grazing. In the corner of the pasture was a small woodland tract of about two acres that contained a rather large quantity of Carolina jessamine. This poisonous plant, like most of the others, usually is not eaten when palatable forage is plentiful; but in this pasture the broomsedge was mainly dry, unpalatable, and closely grazed by the first part of August, and the cattle then ate the green Carolina jessamine. The poisoning could have been prevented, and cows representing several hundred dollars over a period of years saved, either by fencing off the small two-acre tract or by destroying the plant. The farmer did not do this because he did not recognize that the plant was poisonous.

A Few Remedies

In another place a farmer had been losing some steers each fall soon after they were put on velvet beans. A small area of Carolina jessamine in the corner of the field probably caused the trouble here, too. Velvet beans are highly palatable, but the cattle craved something green and thus browsed the Carolina jessamine. This loss also could have been prevented very easily by either moving the fence a short distance or by destroying the poisonous plant.

After an animal has been poisoned, treatment is often unsatisfactory and may have little ef-

fect. The outcome in each case depends to a very large extent upon the amount of toxic material that has been eaten and assimilated. Treatment is usually directed toward eliminating any of the toxic substance that still remains in the digestive tract. In most cases specific treatments are not known except in the case of black cherry and common chokecherry where an intravenous or intraperitoneal injection of a combination of sodium thiosulfate and sodium nitrate by a veterinarian is helpful if given promptly. For poisoning by lambkill kalmia and mountain-laurel a mixture composed of one cup of melted lard, two eggs and a quart of sweet milk given about every six hours usually is helpful.

If treatment is to be of any value the poisoning must be detected soon after the plants are eaten, therefore it is highly important that the symptoms be recognized. In most cases the eating of poisonous plants produces symptoms that are somewhat similar. The most common symptoms are weakness, trembling, lack of coordination. In addition to these, many poisonous plants cause frothing at the mouth, nausea, attempting to vomit, and spasms.

Livestock losses from poisonous plants can be reduced by farmers recognizing the dangerous plants and taking every precaution to keep the animals from eating them, and giving early treatment where it is feasible.

Crossing Sheep

Crossbred sheep show up to advantage, and in experiments to date even more differences are apparent among the breeds of sheep than among the breeds of hogs. This opens the way for extensive research work.

On three occasions at different experiment stations, native ewes when crossed to rams of other breeds were more productive than those raising purebred lambs, by 11, 14, and 19 percent, respectively. In several cases the increase ran 40 percent. Successful breeders are very careful regarding the females and especially critical in the selection of purebred sires. A crossbreeding program will go a long way toward producing more with less, for the man who puts serious thought into his breeding program.—T. H., Minn.

—*Successful Farming*

Better Breeding the Key to Future Profits

Condensed from Poultry Tribune

Dr. M. A. Jull

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AMONG all of the uncertainties in this war-ridden world, one thing is certain; laying hens are going to have to lay better than ever to enable market egg producers to make good profits in the future.

Even for the duration, higher egg production per bird is necessary to enable the flockowner to make a reasonable labor income over the mounting costs of feed, the nutritive value of which has depreciated because of scarcities of various kinds of feedstuffs. Practically all poultrymen realize that the best diets that can be obtained and the most careful management will not compensate for poor laying ability. *A hen just must have laying ability bred into her or she cannot shell out eggs at a profit.*

One of the best illustrations of this fact is borne out by the high and the low pens in each of three varieties at one of the officially conducted egg laying contests in this country about 25 years ago. The high pen of White Leghorns averaged 202 eggs per bird and the low pen averaged 130 eggs; the high pen of Barred Plymouth Rocks averaged 206 eggs and the low pen averaged 122 eggs; the high pen of White Wyandottes averaged 226 eggs and the low pen 142 eggs. *The difference in each case was due to breeding,* because all pens were fed the same and were kept under identical conditions of management. The low pens had not been bred for high egg production.

Coming down to modern times, additional facts are available which demonstrate how *blood will tell.* The federal government publishes annually a directory of the average egg production of the progeny of sires and dams that have been entered in the voluntary National Poultry Improvement Plan conducted in practically all of the states.

For the trapnest record year of 1940-41, a breeder of White Leghorns had one sire whose 123 daughters averaged 167 eggs per bird and another sire whose 121 daughters averaged 244 eggs per bird. Now we do not know the

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TABLE I—Showing Remarkable Differences in Average Egg Production of Daughters of Two Dams of Each Variety Mated to Same Sire

Variety	Sire	Dam	Dam's egg record	No. of daughters	Daughters' aver. egg record
White Leghorns	A	1	245	12	152
White Leghorns	A	2	228	18	228
R. I. Red	B	3	258	11	148
R. I. Red	B	4	251	12	200
New Hampshire	C	5	228	14	156
New Hampshire	C	6	220	10	230
B. P. Rock	D	7	251	14	173
B. P. Rock	D	8	286	12	223
W. P. Rock	E	9	249	9	154
W. P. Rock	E	10	274	13	205

breeding worth of the dams to which each sire was mated, but we are safe in assuming that the second sire was a much better breeder than the first sire, since the difference in the average egg production of their progeny was 77 eggs per bird.

A breeder of New Hampshires secured an average of 189 eggs from 89 daughters of one sire and 229 eggs from 86 daughters of another sire. The daughters of one sire laid an average of 40 more eggs per bird than the daughters of the other size.

If you want more convincing information on how *blood will tell,* look at the records of egg production of the progeny of each of two dams mated to the same sire, for several varieties, given in Table 1. The records of egg production of the progeny are hen-housed averages, which are determined by dividing the total egg production by the original number of progeny.

The figures in Table 1 show that in the case of each variety, the second dam was much the better breeder of the two dams mated to the same sire. A flock-owner wanting to get cockerels for breeding purposes or pullets for laying and breeding purposes would certainly want to get chicks from the second dam of each variety.

$700 More for Better Breeding

How much is better blood worth to a flockowner? A 400-bird flock of 4-lb. Leghorns laying an average of 152 eggs, the same as the progeny of Leghorn dam No. 1 in Table 1, would produce 5066⅔ dozen eggs on about 31,250 lbs. of feed, which would amount to about 6.2 lbs. of feed per dozen eggs produced.

Another 400-bird flock of 4-lb. Leghorns averaging 228 eggs, the

same as the progeny of dam No. 2 in Table 1, would produce 7600 dozen eggs on about 35,550 lbs. of feed, which would amount to about 4.7 lbs. of feed per dozen eggs produced. The 152-egg flock consumed an average of 1.5 more lbs. of feed per dozen eggs laid than the 228-egg flock, a very important factor in these times when the cost of feed amounts to about 60 percent of the total cost of producing eggs.

Assuming the price of a mash-and-scratch diet at $48 per ton and eggs at an average price of 33 cents per dozen, the 152-egg flock would consume $750 worth of feed and would produce $1,672 worth of eggs; whereas the 228-egg flock would consume $852 worth of feed and would produce $2,508 worth of eggs. Depending on the section of the county, feed and egg prices vary considerably. Use your own feed and egg figures and do a little calculating.

What a difference good breeding makes; 228 minus 152 equals 76 eggs per bird which accounted for an increase of $734 in egg receipts over feed costs from the 228-egg flock over the 152-egg flock. High egg production not only increases gross receipts but at the same time increases the producer's net income on every dozen eggs produced. As a matter of fact, the 228-egg flock would have the advantage in securing a higher average price for eggs because relatively more of them would be produced during the high-priced fall season.

Feed Cost Reduced

It should also be kept in mind that every time the price of feed goes up, the cost of producing eggs increases relatively more in a poor producing flock than in a good producing flock. For instance, if the cost of feed increased from $48 to $55 per ton, with a flock of 4-lb. birds the feed cost of producing eggs in a flock laying at the rate of 40 percent would increase from about 15.4 to about 17.9 cents per dozen, or

TABLE II—Feed Cost and Net Returns Per Dozen Eggs in Relation to Annual Egg Production

Flocks	Eggs per bird per year	Feed cost per dozen, cents	Net returns per dozen, cents
276	124 or less	10.7	—1.2
Michigan	125-149	10.0	1.2
1932-35	150-174	9.3	2.9
	175-199	8.7	4.2
66	109 or less	18.0	—5.0
Illinois	110-149	15.4	1.7
1937	150 or more	12.4	4.3

about 2.5 cents more per dozen; whereas in a flock laying at the rate of about 70 percent the feed cost of producing eggs would increase from about 9.6 to 11.2 cents per dozen or about 1.6 cents more per dozen.

One very interesting fact is to be noted in connection with the 228-egg flock as compared with the 152-egg flock; the 228-egg flock produced 2,533⅓ more dozens of eggs on about 4,300 more pounds of feed, which is at the rate of one dozen eggs for approximately 1.7 lbs. of feed. This is something to think about in these times of feed scarcity. Just think of the million fewer tons needed by the poultry industry if the flocks of the country laid much better than they do.

The higher the level of egg production, the lower the feed cost per dozen and the greater the net returns per dozen, as shown in Table 2 (above) from surveys of 276 Michigan farms from 1932 to 1935 and 66 Illinois farms in 1937.

The figures in Table 2 show that in the case of both the Michigan and Illinois flocks, there was either a loss or very little profit in egg production until an average production of about 150 eggs per bird was attained.

Ample Room for Improvement

Throughout the United States there are many thousands of flocks that do not average 150 eggs per bird; in fact, most of the flocks of the country do not, judging by the figures representing the average egg production per bird for all laying stocks in the country.

Simplified Farm Flock Breeding Program

The discussion up to the present has brought out four important facts: (1) good egg production is determined largely by good breeding; (2) feed costs at present represent about 60 percent of the total costs of egg production, and the higher the egg production per bird the lower the feed cost and the greater the net returns per dozen eggs produced; (3) the average egg production of the farm flocks of the country is so low that the majority do not make a profit over feed and all other costs of egg production; (4) it is possible, however, to develop a profitable level of egg production in almost any flock, as a large number of poultrymen have already done.

Many flockowners of 300 to 400 bird flocks could do a lot in selecting and breeding to improve the level of egg production in their flocks. The first thing for them to do is to adopt the following program as an objective: (1) early sexual maturity, Leghorns commencing to lay at about 150 days of age and general-purpose varieties at about 170 days; (2) pullets of all varieties should lay

at a minimum rate of about 50 percent or at least 15 eggs per month; (3) there should be little or no broodiness, since broodiness may reduce first-year records considerably; (4) pullets should continue to lay for a period of approximately 10 months from the time they start to lay.

Practically every flockowner knows when his chicks were hatched, whether he hatched them himself or bought them from a hatchery; so that he can readily tell the age they commence laying by observing the development of the comb and wattles, the spreading apart of the pubic bones, and the enlargement and moistened condition of the vent. By going over his flock every week or so in the late summer and early fall, he could readily identify the early maturing birds. By putting red celluloid bands on them they would be identified as birds to be saved for breeding, providing they later proved to be satisfactory otherwise.

Rate of production can be determined approximately by observing the degree of depigmentation of the beak and shanks, handling of the birds individually being necessary. A bleached vent shows that the pullet has laid about 10 eggs; the lower two-thirds of the beak bleached shows that she has laid about 25 eggs and a completely bleached beak shows that she has laid about 35 eggs; fronts of the shanks bleached indicates a previous production of about 95 eggs; rear of the shanks bleached indicates production of about 160 eggs. According to the degree of bleaching of these parts at different times of observation, it is possible to identify the pullets that lay at the best rate; band them with a white celluloid band and keep them for future breeding purposes.

Birds that go broody are easy to cull since broody hens remain on the nest at night. Every time a bird becomes broody band her with a black band so that she will be culled at the end of the laying year.

The best layers in the flock are those that molt relatively late, the annual molt not commencing much before the latter part of September or October at the end of the first-laying year. Band the late, rapid molters with a blue band for keeping as future breeders.

Now by regular culling of the flock it is possible to eliminate the poor producers from time to time, in order to save feed and maintain egg production at a profitable level. Also, by identifying the good producers by the red, white, and blue banding system indicated previously it would be possible to develop a good laying strain because early sexual ma-

turity, good rate of laying, broodiness, and persistence of production are inherited.

A simple but worthwhile breeding plan for a poultryman with a 400-bird flock would be to keep one 100-bird pen of yearling hens carefully selected from the three 100-bird pullet pens on the basis outlined previously, the yearlings to be used for breeding purposes each year.

It would pay most flockowners to purchase at least 100 high quality pedigreed chicks from an outstanding breeder who progeny tests his breeding stock and has matings comparable to those represented by dams Nos. 2, 4, 6, 8, and 10 in Table 2. Select 100 of the best pullets reared and put them in one of the 100-bird pullet pens to compare their records of production with the other two 100-bird pens of pullets from the flockowners own flock. (This would require the purchase of around 250 chicks instead of 100.) Select the very best cockerels in the fall for mating to the 100-bird pen of yearlings, about 7 if Leghorns and 8 or 9 if general-purpose breeds, although a few extra should be banded and held in reserve.

If the chicks purchased give excellent results, go back to the same breeder for more chicks each year until the average egg production of the flock has been developed to a satisfactory level. Continue with the regular culling program of the pullet laying stock, saving the red, white, and blue banded birds for the yearling breeding pen each year. Be most particular about the selection of males for breeding purposes because each male usually has on the average at least ten times as many progeny as each dam.

Farm flockowners who have trouble with egg size, poor shell quality, or poor interior quality could install trapnests in the yearling breeding pen and trap the breeders individually during the latter part of November or the fore part of December, eliminating undesirable individuals.

Cover Crops Are a Sign of Good Farming

Condensed from Eastern States Cooperator

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OF all the practices recommended for conserving northeastern soils, cover cropping is the most generally applicable. It is nature's method of holding and restoring soils. Cover crops are beneficial to soils of flat topography as well as to those with erodible slopes. Both water and wind erosion can be reduced to harmless minima by cover crops. Furthermore, they are a source of valuable soil organic matter sorely needed by ailing soils. And, what is important right now, they may furnish valuable fall and spring pasturage to supplement meager feed concentrates.

WHAT THEY ARE: *Cover crops* are those which are grown primarily for soil protection, but may also serve other useful purposes. Winter cover crops occupy the land during the winter period and are the most common and the most useful kind in the Northeast. However, cover crops may be grown during any part of the growing season, and it is good conservation practice to plan to keep the land covered with vegetation most of the time. Crops grown primarily for soil improvement by plowing under are called *green manure* crops. They may also serve as protective cover, but some crops which are excellent for green manure—for example, soybeans—do not give the best protection against soil erosion. The term *catch crop* is often applied to a soil-improving crop such as buckwheat, that occupies the land for a comparatively brief period between main crops.

HOW USED: Most commonly, in the eastern states, the entire cover crop is plowed under for soil improvement after it has served its purpose as a protective cover. Occasionally, a cover crop of rye is allowed to mature for grain and straw. In some cases, particularly when allowed to make good growth by early sowing on fertile soil, as rye following tobacco, the small grains are pastured in fall or early spring. This latter is good practice if the cover crop is not over-grazed in the fall. Young growth of small grains on fertile soils is high in protein. If fertility is low, additional fertilizer, particularly one high in nitrogen, is recommended.

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Cover crops are especially needed in any system of soil management in which grass is not grown at all or is grown only at infrequent intervals. Because of rather limited areas of land physically adapted to intensive cultivation, most of the truck and vegetable crops, and tobacco, are grown almost continuously on suitable land until and if a condition of the soil is reached which makes farming unprofitable. Land under such management may be expected to benefit markedly by cover crops.

ORGANIC MATTER ADDED: The yields of organic matter that may be expected from cover, green manure, and catch crops vary widely and depend on type of crop, stage of maturity, soil fertility and seasonal conditions. Enormous yields have been reported. Under favorable conditions, 15 to 20 tons of green material or two to four tons of dry matter per acre from tops and roots may be expected from such crops as rye, Japanese millet, and Sudan grass, if they are grown to or near maturity. However, it is usually preferable to plow under cover crops when they are immature. At such stage of development, yields of organic matter are less than if the crop were more mature, but young growth is richer in protein and decomposes more rapidly in the soil.

As an example of expectable yield of rye as a cover crop, take the following results: Rye was sown for cover on a soil which had grown tobacco and immediately after the crop had been harvested in August. On May 13 following, when the field was being plowed in preparation for another tobacco crop, a sample of rye (tops and roots) was taken, dried, weighed, and analyzed for nitrogen.*

The dry weight of tops was at the rate of 2904, and of the roots 1936, pounds per acre, or a total of 4840 pounds, equivalent to about 12 tons per acre of tops and roots, green weight. The figure for the roots does not include the deeper roots which were not taken. It has been estimated that a single rye plant under very favorable conditions will produce a root system, including root hairs, totaling more than 350 miles.

The tops of the rye sample contained 1.8 percent, and the roots 1.5 percent, nitrogen. Thus the tops and roots together contained 81.3 pounds of nitrogen per acre, in addition to important but undetermined amounts of other nutrients. If the field had been fallow, a considerable proportion of all these nutrients, but particularly nitrogen, would have been leached from the soil. If the land sloped, both more nutrients and soil would have been lost by ero-

*Weights and nitrogen determination by Karol J. Kucinski, Agricultural Department, Massachusetts Experiment Station.

sion. The organic matter of the cover crop is a clear gain.

COVER CROPS FOR THE NORTHEAST: There are many crops that may be used for soil protection and improvement, but a comparatively short list includes most of the varieties needed for average conditions. The ideal cover crop is one which grows rapidly, covers the soil completely, has basal foliage at or near the ground level, and produces a large, fibrous root system. The sod-forming grasses, small grains, clovers and vetch give the best protection, but because of the comparatively short spring season, the rapid-growing small grains are usually preferred for winter cover. Cost of seed is another factor, legumes being the most expensive.

Legumes, if used at all for cover crops, would ordinarily be most effective on soils of low or moderate fertility, and as a matter of insurance against total failure, should have a small grain sown with them. Rye or wheat and vetch are often sown together for this purpose. Ladino clover, on account of its creeping habit, is the best cover crop of the clover group, but must be sown about mid-summer to be effective for winter cover. Following is a partial list of the more important cover crops for the Northeast:

Crop	Seeding Time of	per Acre Rate
Barley	April-Sept.	2 bu.
Buckwheat	June-Aug.	40 lbs.
Domestic Ryegrass	April-Aug.	25 lbs.
Ladino Clover†	April-July	3 lbs.
Oats	April-Sept.	2 bu.
Winter Rye	Aug.-Oct.	2 bu.
Winter Wheat	Aug.-Sept.	2 bu.
Vetch†	July-Aug.	25 lbs.

†With a companion crop, usually a small grain.

Local weather and soil conditions are important factors in determining the latest safe date for seeding cover crops.

EDITOR'S COMMENT: *It would be well to keep in mind that the example of rye performance came from a most favorable situation. Furthermore, it is not proposed to place undue emphasis upon rye in preference to other crops, as it is generally understood that ryegrass from late August to early May ordinarily produces more organic matter than rye. It is also a better cover crop than winter rye because it develops a more extensive root system.*

Stubble Mulch in the Southern Piedmont

Condensed from Soil Conservation

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THE utilization of stubble mulches and crop residues involves such factors as the kinds and quantities of residue materials produced, the tools available for the required tillage, and the seedbed requirements of the succeeding crops.

Small grains and most hay crops leave light to moderate amounts of residue on the fields. Legume crops harvested for seed leave moderate to heavy residues, depending largely on stand densities and volumes of stem and leaf growth left on the ground or scattered out when combine-harvested. The legume stubble mulches are richer in nitrogen, and thus more valuable than the non-legume stubble mulches. Those derived from close-growing types of legumes are more effective for erosion control and for fertilizing. Regardless of harvesting method, most annual farm crops, excepting peanuts, leave roots in the soil to die and decay, whereas perennials persist and gradually develop massive root systems. The more extensive the root systems, the more valuable they are for soil improvement and conservation purposes.

Residues and stubble mulches are available in late spring from winter annuals, and in the fall from summer crops. Tools for stubble land preparation in the Southeastern Piedmont include principally turn plows, disk-tillers, rippers and scooter-plows, and harrows of various types.

Some of the questions regarding tillage of stubble mulches are whether to turn them under, whether to turn them in and only partially cover them, or whether to loosen the soil by shallow ripping so as to leave them practically intact on the surface. In certain crop successions, no tillage at all seems best. Leaching of nitrogenous materials in surface residues due to weathering, and the nature of the decomposition complexes, with special reference to the evolution of nitrates from various residues, are subjects on which more information is needed.

Wheat-straw mulch applied by hand in 1940 to an 11-percent slope run-off plot 70 feet long, which had been disk-harrowed

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and sown to Kobe lespedeza, showed astonishing ability to reduce erosion to a negligible quantity and to maintain the highest infiltration. The action of the close-growing summer annual, Kobe lespedeza, combined with the mulch, unquestionably enhanced its effectiveness. Starting in April, 1940, this plot lost only 1.2 percent of the rainfall as run-off for the remainder of the year, and only 0.24 ton per acre of soil. A companion plot, similarly handled, but without the applied mulch treatment, lost 24.2 percent run-off and 12.62 tons per acre of soil, during the same period.

The value of continued self-mulching has been shown by the subsequent performance of these two plots, since both of them have remained in pure stands for repeated seed production, leaving the full combine-harvest stubble mulches on the land. Soil and water losses have continued to be very low. They have, in fact, shown by far the best conservation record to date of any method under test on the Station run-off plots, despite the severe erodibility of the site they occupy. In addition, seed production of 282 pounds per acre in 1942 on these two waste-land plots equaled or exceeded the seed yields obtained on the best of the cropland fields.

Hand-applied straw mulching is hardly practical under farm conditions except for small critical areas. The results do show that practically complete control of soil and water loss was obtained even on steep slopes with the topsoil entirely washed away. Under the considerably less erodible conditions of average cropland fields, every approach to this ideal condition that is possible in any practical cropping system holds high promise of being effective.

A heavy stubble mulch such as that developed by well-established kudzu with only reasonable quantities of hay removed, has provided almost perfect erosion protection and greatly reduced run-off losses. Kudzu residues plowed under have greatly stimulated corn yields on poor land unsuited to corn production by ordinary cropping methods.

The harvesting of all plant growth including roots, as in the case of harvesting peanuts for both nuts and hay, is a serious soil-depleting practice.

On the other hand, when only the seeds of legumes are combine-harvested, there is left on the field nearly all of the plant materials, including leaves, stems, and roots. These residues are relatively rich in nutrient value and have both soil-protective and fertilizing value.

The proper handling of legume residues to utilize the nitrogen released during decomposition is

especially important during wartime. The decomposition of soft green plant tissue is rapid when plowed under as green manure in the presence of warmth and moisture which favor the activities of soil fungi and bacteria. Opposite conditions are represented by hard, woody, dead plant residues lying on top of the ground during dry cold weather.

The rapid release of nitrates following the turning under of a summer legume green manuring crop, or of the later green growth following hay cuttings, suggests that fall-planted crops should quickly succeed them in order to utilize the nitrates and prevent them from being lost by leaching.

Lespedeza-stem mulch, as distinguished from the complete leaf and stem residues, has some apparent fertilizing value for the following summer crop. This was shown in Station tests in which the stem-mulch material of second year volunteer Kobe lespedeza seed crop residue was raked off duplicate plots in the fall of 1941, and left in place on adjacent plots. The third-year volunteer lespedeza hay crop that followed was 11 percent larger where it had been subjected to the full effect of residue. In August, when the hay was cut, the stem residues of the last year's crop had virtually all weathered down and disappeared.

Another instance lending support to the belief that lespedeza stem mulch has fertilizing value was shown by applied mulch tests begun in the early spring of 1940 on eroded land sown to Kobe lespedeza. During the first growing season, waste cowpea hay which had already started to rot when applied as a surface mulch stimulated the highest lespedeza hay yield. During the second season, in 1941, the plots in which lespedeza straw, or stem mulch, had been originally applied produced the greatest volunteer hay crop. The plots mulched with cowpea hay were in second place, and the wheat straw and pine straw mulched plots next in order.

Wheat has been grown for several years on large fields as a starting crop following weedland or ordinary row-cropping field conditions, and as a second annual, or double crop, in lespedeza fields. When both crops have been combine-harvested in turn, the lespedeza has almost always succeeded as a dense volunteer stand. In the fall of 1940 three fields were seeded to wheat, and several comparable fields were available for comparison in which wheat had been preceded by 2 or 3 years of lespedeza under a stubble-mulching practice. The latter fields produced up to 100 percent higher wheat yelds in 1941.

Following three years of the wheat-lespedeza sequence, utilizing all residues for protection and

soil improvement, corn in 1941 produced 39.3 and hegari 48.6 bushels per acre as compared with approximately 20 bushels per acre from the same class of land the same season in the usual cotton-corn-cowpea cropping practices.

Cotton, following an early spring turn-under of Korean lespedeza stubble mulch, required no nitrate of soda side dressing to produce the highest cotton yield grown on the station fields in 1941. Corn failed to respond to any additional nitrate side dressings under similar conditions in both good and poor corn growing seasons. In a 3-year stand of kudzu, in which strips were plowed out for corn and large quantities of kudzu stubble mulch turned under, the corn yielded well and did not respond to nitrate side dressings. There is little question that legume stubble mulches are capable of supplying substantial amounts of soil nitrogen for the use of the succeeding crops.

Hegari stubble mulch, probably the heaviest produced during the combine harvest of any grain crops, was removed from parts of two fields, and left in place on the balance of the fields. None of the following winter crops of barley, crimson clover, nor of the subsequent summer crops of lespedeza and soybeans was affected perceptibly in stand or yield. The non-legume mulch materials did not produce in the soil any appreciable effect tending to increase crop yields.

These results bear out the contention that practical conservation management of erodible lands should favor cropping plans that provide for accumulations of legume residues to be left on the land.

The leaf residue remaining on the land in good stands of sericea, regardless of whether hay or seed crops, or both, were harvested, has for the past 2 years supplied excellent starting conditions for new overplantings of crimson clover in the fall. This winter clover is often difficult to grow under ordinary cropland conditions. When over-planted in sericea, clover helped to check erosion during the winter and early spring periods, and the combination stand produced a heavy May cutting of very palatable hay.

Crimson clover has succeeded well when sown in soybean and cowpea combine stubble mulch. On the other hand, crimson clover sown in non-legume corn and hegari stubble mulch land in the same field started out well and then died out in one winter. Apparently, nitrates produced by leaching and rapid decomposition of leaf residues of soybeans, cowpeas, sericea and kudzu stimulated crimson clover seedlings sufficiently so that they were

more vigorous and better able to resist the effects of fall drouths and early freezes.

Present indications are that a very important application of stubble mulch utilization methods applies to the annual lespedezas and the handling of their residues in row crop rotation for the multiple purpose of obtaining decreased runoff, better erosion resistance, and increased soil productivity. Our data is based largely on 4 years' experience in handling the annual lespedezas in various cropping practices on several hundred acres of typical Southern Piedmont cropland in both row crop rotations and as self-maintained pure stands.

For cropland uses, to obtain the most benefit from the lespedezas there seem to be at least five good rules: (1) make initial plantings in small grain; (2) plant at considerably heavier seeding rates than are generally recommended, never less than 40 and preferably 60 pounds per acre to obtain a full seed crop and as heavy residues as possible the first year; (3) allow at least 2 years' growth of lespedeza to obtain maximum after-effects; (4) cut lespedeza hay yearly, not later than early-bloom stage if subsequent fall growth before frost is expected to produce a good amount of residue material; if harvested for seed instead of for hay, the maximum amount of residue material will be developed — preferably, the first-year stand is harvested for seed, since this practice practically assures a thick volunteer stand the following year for hay; and (5) turn under the second-year stubble mulch during the winter or in early spring, as the weather permits, to allow for partial decomposition of the residue and settling of the seedbed.

Legumes can help to obtain more efficient use of cropland (1) by developing permanent pastures of grass and clover sod on bottom land, (2) by making possible upland temporary pastures for a succession of small grain and lespedeza or (3) by establishing themselves in sericea, kudzu, or other crops suited for pasturage. Livestock may then pasture off the bulk of the feed they require on as nearly a year-round schedule as possible, thus reducing the need for feeding legume hay and permitting more residues to remain on the fields. Most Southern farms are not adequately equipped to harvest efficiently and store large quantities of hay, yet livestock enterprises are expanding. Handling crops in this manner, the smart farmer can obtain an occasional manuring of some of his temporarily pastured cropland fields and secure added land protection and soil improvement.

On average croplands, if lespedeza, cowpeas, or soybeans are to

follow, the hay-crop stubbles may be turned or disk-tilled and oats drilled in September in order to give oats the early start that it needs for best winter survival. Winter legumes usually would be expected to succeed best as a following crop if sown in the disked hay stubble and covered lightly. After a fall seed crop of lespedeza, soybeans, or cowpeas is combine-harvested, a planting of wheat or winter barley is generally preferable, drilled on a disk-tilled seedbed with the heavier stubble mulch only partially turned under. In the case of Kobe lespedeza, combine-harvested for seed in November, there appears to be little object in following with winter legumes planted so late, since the stubble mulch of lespedeza is known to supply good winter protection and cold weather checks decomposition of surface residues. Experience has shown that turning under of this stubble mulch can proceed at any time weather permits during the winter and early spring months without inviting undue soil loss by erosion while the land is being prepared for summer crops.

Grain Feeding Methods

Experiments at the Florida State Agricultural Experiment Station indicate that it makes no difference in feed consumption and egg production in the way grain is fed, using any of the methods tried out at this station. According to the experiments, 4 lots of from 40 to 48 pullets with mash, self-fed in hoppers were given grain according to the following methods: grain mixtures hand-fed in the litter in the evening, hopper-fed ad libitum, and separate grains corn, wheat, and oats of the grain mixture fed separately in hoppers. The tests were conducted for two years. When lights were used, however, best results were obtained with the lot which had mash, self-fed, and grain fed in the litter, once each evening.

Inbreeding and Line Breeding

Condensed from The Shorthorn World

L. M. Winters

University of Minnesota

FOR years inbreeding has been one of the most controversial topics among livestock breeders. Arguments have prevailed as to the merits and demerits of inbreeding, and there have been arguments regarding the differences and similarities between inbreeding and linebreeding.

We can define inbreeding as the mating of individuals that are more closely related than the average of their breed. This, then, allows for a wide range in the degree of closeness; sire and daughter, son and dam or full brother and sister matings are as close as the animal breeder can go and second cousins are about as distant as he can go and still call it inbreeding.

In a final analysis, inbreeding and line breeding are one and the same, although at times there may be a slight difference in objectives. In inbreeding the number of ancestors is reduced; this results in the production of an individual that is more closely related to its grandparents or great-grandparents than would normally be the case. In linebreeding the breeder attempts to retain a higher degree of relationship to a certain individual or individuals than would normally occur. By so doing he mates related individuals and thus by linebreeding he inbreeds and likewise by inbreeding he linebreeds. Inbreeding and linebreeding are then one and the same process, although when a breeder states that he is linebreeding his object usually is to hold a closer relationship to a prized ancestor than would normally be the case, and by so doing, he inbreeds.

Inbreeding reduces the number of ancestors and this automatically tends to purify the stock. By so doing both desirable and undesirable traits are brought to light. Unfortunately, more undesirable than desirable traits are usually brought out. This has led many to believe that inbreeding in itself destroyed something in a stock and this has led them to condemn inbreeding as a practice.

In thinking clearly of inbreeding the first point that must be made perfectly clear is that inbreeding in itself does not destroy anything in a stock; if weaknesses

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appear they are weaknesses that are in the stock and have been brought out by the inbreeding. The process of purification (inbreeding) is what brought them out. Some of the weaknesses are striking, such as "bulldog" calves, incomplete skin covering, short spine, etc. Any stock carrying weaknesses of that kind is improved by having the weaknesses brought out, provided a thorough culling of the animals that produce such calves accompanies the inbreeding.

Weaknesses such as mentioned above are striking in appearance but, fortunately, are not frequent in occurrence. Inbreeding is, however, also accompanied by general effects which are much less striking in effect but which may prove even more disastrous to a herd unless watched carefully. These are the general declines in fertility, growth rate, ability to live, etc. There has been enough careful work done so that we can state with certainty that inbreeding is accompanied by general declines in these factors which are so essential to success in livestock breeding. But let's not get this wrong, for this is not a condemnation of inbreeding; it merely means that inbreeding is not a fool proof method of livestock improvement. If rigorous selection accompanies the inbreeding then these general effects can be reduced, and if the selection is sufficiently rigorous and the inbreeding low enough, improvement may be made in the performance of the stock inbred.

At this point the reader will be asking well then why should anyone be fool enough to inbreed? The answer to that is that when these inbreds are mated to inbreds of another family the general reaction is an improvement in all the elements of vigor, such as, fertility, rate of growth, ability to live, etc. What is more, the vigor of the two lines after being put together is usually higher than in the stock before the inbreeding was started; thus improvement has been made.

In this connection it is important to realize that most people are badly fooled by the actual amount of inbreeding in a given pedigree. The average person will greatly overestimate the amount of inbreeding contained in pedigrees containing a little inbreeding. And another important point is that good stock will take much more breeding than most of us thought they would without showing any noticeable ill effects.

An interesting point in this connection is that the Shorthorn breed rests on a background of more inbreeding than any breed I know of. The old founders of this breed inbreed very closely and over a prolonged period of time. It is my opinion that the breeders of today owe a great debt of

gratitude to these men for laying so sound a foundation and for laying it in a manner that the most advanced thought of today would still have to consider as sound procedure. By that very process these early breeders must have eliminated much that was undesirable from the stock they started with. It is unfortunate that there are some who feel bound to apologize for this early foundation of their breed. Shorthorn breeders should be very proud of what these early breeders did so well. At the same time, isn't it something of a challenge to us today to carry their good work even farther?

At this point we can start to generalize somewhat regarding the applications of inbreeding. A general program of inbreeding will improve any breed of livestock and in my opinion some day some breed association is going to have the foresight to sponsor and subsidize a major program of inbreeding whereby a large number of lines or distinct families will be developed within the breed. Then when these lines are crossed we have reason to believe the breed as a whole will receive a great deal of benefit.

The individual breeder, however, doing this inbreeding is likely to take something of an immediate loss from the procedure. For this reason the individual breeder who needs to make his herd pay its way as he goes needs to approach inbreeding with a great deal of caution. We do have, however, many wealthy breeders who are breeding livestock for pleasure and as a means of contributing to society; these men are in a position to absorb these losses and in the end make a lasting contribution to their favorite breed.

In my opinion it is a big mistake to begin inbreeding without having it accompanied by a most exacting program of selection for the traits we want to breed in our livestock. And again in my opinion the traits that will make or break a breed are fertility, the ability to live, the ability to gain weight rapidly, and the ability to satisfy market demands. Furthermore, it is my opinion that these four items of importance rank in the order listed.

The breeder who must make a living out of his herd is in no position to take on that sort of program. He can, however, do some mild inbreeding; let's call it linebreeding if we like that better. In doing that he need not expect any marked benefit to his herd. It will, however, enable him to retain a closer relationship to a very worth while bull than he would in a program of strict outcrossing. In a program of this kind he can go back to a certain herd for herd sires several times in succession. It frequently hap-

pens that the small breeder buys a herd bull from a herd that he has confidence in and then is afraid to go back to the same herd for a second sire because of the fear of too close inbreeding. In most cases he need have no worry about this. In only rare cases will the second bull be a half brother to the first bull and that makes him only a half uncle to the first bull's daughters. This after all is very mild inbreeding and under average conditions it would take many generations before a noticeable decline would be expected in the animals so produced. In fact, if the selection was close an improvement could be expected.

Large wealthy breeders can afford more risks than the little fellow. What is more, a large herd offers more room for maneuvers.

In many instances we regret the loss of the old sire; we don't know where to go to find another that is as good. In cases of that kind the only way of retaining a high relationship to him is through a program of inbreeding or call it linebreeding back to the old sire.

Apply Lime Any Season

E. E. Barnes, of the Ohio Experiment Station described a 16-year test at Wooster where lime was applied at different places in the rotation, with that used on land to be plowed for corn giving the best all-around results. This was true even for the first corn crop grown after the lime was applied. Not only are maximum crop yields obtained from this method of liming, but it enables the farmer to get his lime on the ground when other demands for labor are higher. On sod fields Barnes recommends spreading any time during the winter or spring when the ground is in fit condition for using a spreader.

—Ohio Farmer

Guernseys and Grass on Grandad's Bluff

Condensed from Guernsey Breeders' Journal

Ralph H. Musser

Regional Conservator, Upper Mississippi Region, Soil Conservation Service, U. S. D. A.

A Guernsey herd's five-fold increase in butter fat output reflects the land's remarkable response to soil conservation on a badly washed farm saddling the steep ridge terminating in Grandad's Bluff overlooking the Mississippi River above La Crosse, Wis.

Although 1931 wasn't a poor crop year in this rugged unglaciated dairy section, the fellow who then rented this 160 didn't raise feed enough for his 10 milk cows, four heifers, four horses, and a few hogs.

"Oats on the place that year headed out when they were a foot high," County Agent Walter E. Spreiter told me. "The corn was spindly stalked and yielded only nubbins, and the hay, as I recall, was largely quackgrass and ragweed."

Here was a once highly productive farm whose soil was now run down and eroded by years of up-and-down-hill cultivation and lack of proper management.

Wisconsin's legislature had appropriated $10,000 to enable the university's college of agriculture to acquire and stock a farm where a study of erosion control under dairy farm conditions would be undertaken.

This Grandad's Bluff farm answered the need for a farm that presented a host of varying erosion problems. With its woods, steep pasture, and sloping cropland, the farm's topography was representative of much of southeastern Minnesota, northeastern Iowa, and southwestern Wisconsin. Fields slope in all directions in varying degrees.

Noble Clark, Associate Director of the Wisconsin Agricultural Experiment Station, Dr. Hugh H. Bennett, now Chief of the U. S. Department of Agriculture Soil Conservation Service, and other state and federal authorities agreed with County Agent Spreiter that the farm was well suited for the study of soil erosion and the development of methods for its control.

Upon their recommendations, the college acquired the sorry looking farm that since has be-

Reprinted by permission from the Guernsey Breeders' Journal, Jan. 1, 1944, Peterborough, N. H.

come a spot of inspiration and teaching for thousands of America's dairyland farmers.

You may say: "Sure they grow good crops. I could, too, if I had the government footing the bill on my farm." But let me assure you that any farmer confronted with similar or even less foreboding circumstances could well afford to do precisely what was done here.

And with the assistance of trained technicians of the Soil Conservation Service assigned to the 1,000 farmer-organized and farmer-run soil conservation districts in the nation, farmers are doing just that.

By no means is the Experimental Farm the sole example of the production wonders that complete and properly applied soil conservation programs have wrought on land in this territory. From Soil Conservation Districts we have reports of many dairymen in northeastern Iowa, southwest Minnesota, and western Wisconsin who have doubled their butter fat production without buying a proportionate amount of extra feed or farming more land.

"Soil conservation was and still is our chief objective, but we needed a herd of cattle to graze the experimental pastures and to consume the other crops produced," explained Orville E. Hays, supervisor of experiments and manager of the farm operated co-operatively by the university and the Soil Conservation Service.

The university purchased the farm for $9,000, and with part of the remaining $1,000, George C. Humphrey, who has since retired as chairman of the college's animal husbandry department, purchased locally six Guernsey cows as the foundation for the herd in 1932. One was eliminated a few months later because it reacted to the Bang's test.

In 1933 the farm produced barely enough feed for the five-cow herd whose production totaled 1,096 lbs. of fat and 23,088 lbs. of milk. Contrast that with the 1942 record when the 19-cow herd produced 5,932 lbs. of fat and 121,963 lbs. of milk. And during the latter year, only $20 worth of feed was purchased for the entire herd.

How have the herd and the land been managed to result in this amazing increase in production?

First of all, our men took an inventory of what was left of the farm's productive resources. They measured and recorded on a map the amount of topsoil remaining, the soil type, and percentage of slope of each acre. Then they knew what they had to work with, and on some spots they didn't have much.

The soil surveyors found, for example, that half of the topsoil

had eroded from the 55 acres of cropland, and that most all of the productive topsoil had washed from approximately eight acres.

With this information as a guide to the land's productive capabilities, Hays and Raymond H. Davis, who preceded him, worked out plans to halt further unnecessary loss of soil, and at the same time raise its fertility and productivity levels.

"We haven't done things on an extravagant scale," Hays said. "We applied lime and fertilizer only in amounts indicated by soil sample tests. We've followed a good rotation and applied all available barnyard manure to corn, hay, and pasture land. Our productive conservation practices include the growing of corn or small grain in strips on the contour between soil-locking legume-grass bands, terracing, grassed waterways, and pasture renovation.

"Our out-of-pocket costs were largely for lime and fertilizer. Our three-ton application of lime has lasted for more than ten years. And we've put on a 200-pound application of 0-20-20 fertilizer twice. On the basis of a five-year rotation, our lime and fertilizer cost averages only $1.45 an acre annually.

"Ninety acres of woods were pastured in 1932. It was obvious to us that on much of this wooded area the cows got little more than exercise, due to the small amount of grass being produced under shade. Little reproduction of trees was evident where the cattle grazed heavily. By clearing land needed for pasture and protecting that assigned to timber production, we now have more pasture from fewer acres, better timber, and less runoff and erosion.

"Most of the woods was on a slope of more than 30 per cent. We fenced that off from the stock, and now it is producing timber once more. But we cleared 20 acres of the more level woods, using some of it to increase permanent pasture acreage and the remainder for cropping purposes.

Field boundaries and lanes were put as nearly on the contour as possible. Fields that sloped more than 10 per cent were strip cropped on the contour to a five or six-year rotation that included either three or four years of hay. Those of less than ten per cent slope were strip cropped or terraced and cropped to a three or four-year rotation, including one or two years of hay.

All the 30 acres of pasture have been limed, fertilized, and manured. Pastures, like cropland, remove plant food which needs to be replenished by fertilizer. Ten acres have been spring toothed and seeded to either alfalfa-brome or sweet clover-brome combinations.

Under the grazing system practiced, the cattle are turned on the renovated pastures approximately May 1 to keep the brome from crowding out the legumes. A week or ten days later, the stock is shifted to bluegrass.

When the bluegrass growth slackens in late June or July, the renovated pastures again are called upon. Normally more bluegrass is available after the renovated ones have been grazed the second time. In years when it's too dry for recovery of bluegrass, the cattle are switched from the renovated pastures to hay fields from which no second cutting is made.

In years when bluegrass grows better than usual, the renovated pastures that have alfalfa for the legume are used for either hay or silage.

"In the seven years this system of pasture management has been used," Hays said, "we haven't had to overgraze seriously, nor have we had a single instance of bloat.

"We have made no special effort to prevent bloat other than to make sure that the cows are pretty well filled immediately before we turn them into the legume-grass for the first time."

Corn, small grain, and hay yields were below the county average in 1932, but now the soil-saving practices and good soil and crop management have lifted them to the point where they're now above the county levels.

The farm's corn yields now average 23 bushels per acre higher than the county average for that crop; barley, five bushels higher; and hay, now mostly alfalfa-brome, three-quarters of a ton higher. And there's ample feed for four heifers, four calves, and two horses in addition to the 20 milkers.

In spite of this recovery, Hays pointed out, the experiments show that soil can't be restored fully to its original productivity with the usual fertilizer and cropping practices.

"We've found that hay will produce nearly as well on treated, eroded soil as it will on only slightly eroded, but corn and barley won't rise to the same high levels," Hays emphasized. "Last year, after ten years of uniform treatment, we made a study to determine the effect of depth of surface soil on the yields of barley in a field that had eroded to varying depths prior to 1932.

"In that field the plots with nine inches of surface soil yielded 42 bushels per acre, while the ones with less than three inches yielded only 16 bushels, a 26-bushel difference due to erosion."

For the $1.45 yearly cost of the lime and fertilizer, however, the farm under conservation practices now pays cash returns of $18 an acre a year higher than the aver-

age for the county. Isn't that worth the effort?

The new system of farming has brought the per-acre average of crops produced on the place from below the county average to nine dollars above it. By skillful management, good balanced rations, and selection of heifers from high producing dams, Edward L. Lemke, foreman of the farm since the state acquired it, has been able to obtain $2.50 worth of milk for each dollar's worth of feed consumed, or more than double the value of the extra crops produced.

The farm is a member of the La Crosse County Guernsey Dairy Herd Improvement Association, and the herd is tested once a year for both T. B. and Bang's Disease. Pastures are arranged so that the herd never makes any line fence contacts with those on adjoining farms. Lemke began feeding alfalfa silage in the winter of 1939. The last two years the silo has been filled completely with alfalfa which has eliminated the need for protein supplement.

The farm has demonstrated amply that one way of increasing production per acre and butter fat per cow is to enroll every acre on a farm in a practical soil conservation program that is adapted to the land's productive capabilities. And along with that, the results have shown that you can't start too soon to save your remaining topsoil on hillsides and slopes and to begin to rebuild its fertility.

Rye Pasture Cuts Production Costs

Condensed from American Hampshire Herdsman

Dr. W. E. Carroll
University of Illinois

WHETHER you will need to hold over 100 bushels of corn for your early spring pigs or only 55 bushels will depend on the provisions you have made. Pigs farrowed in February or early March must be raised to weaning without suitable pasture unless special pasture is provided.

In tests at the University of Illinois, 100 pounds of gain on sows and litters fed on rye pasture require only 55% as much as the same gain did on similar sows and litters fed in drylot. A similar saving in protein supplement was also realized from the rye.

By seeding the rye early

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enough (before September 1 in central Illinois) to permit it to grow to a height of 10 to 12 inches before growth is stopped by freezing weather, the fall growth can be taken out of "cold storage," so to speak, before growth begins in the spring. In the central part of Illinois this means that pasturing can begin by about March 1 under average conditions.

Ten to twelve full-fed sows and litters per acre will graze off the fall growth indicated above between March 1 and the time vigorous new growth begins. After new growth begins the number of sows and litters can be increased to 14 or 16 per acre, depending on growing conditions.

These numbers have been regularly carried on the good, fertile land of the swine farm at the University of Illinois. On less fertile soil or in case of a poor stand of rye the numbers should be reduced in accordance with the amount of forage available.

In these tests rye, grazed as indicated, has shown an almost unbelievably high value. Compared with raising the pigs in drylot the rye pasture saved 45% of the corn and an equal proportion of protein supplement for unit of gain made on the sows and pigs. An acre of rye so used saved almost 100 bushels of corn and over 500 pounds of supplement. As indicated above, this land is rich and would produce probably 100 bushels of corn to the acre. The point is, however, the average value of an entire season was realized from that land in a grazing period of only 6 to 8 weeks.

Unless the spring is too dry (or too wet) the area used for rye pasture can be prepared and planted to soybeans or even to corn in the more favorable seasons, as the pigs are transferred to other pasture when it becomes available.

In addition to the saving of feed mentioned above, death losses of sucking pigs are considerably lower on rye pasture than in drylot, the pasture pigs are more thrifty and are heavier at weaning, and are accordingly in better condition than the drylot pigs to make rapid and economical gains in the fattening lot.

Humus from Mulching

Condensed from California Cultivator

R. E. Stephenson

RAW plant materials out of which humus is formed, compared with the average soil on a percentage basis, contain five to 15 times as much nitrogen, two to 10 times as much phosphorus and sulphur, besides considerable calcium, magnesium, potassium and other elements essential to the plant. The rate of breakdown of plant materials is more rapid than the breakdown of soil minerals; consequently the rotting organic matter liberates more of its nutrient content in a given time than does the more inert mineral soil.

Nutrients are present in solution in the soil principally as nitrates and sulphates, and sometimes as bicarbonates, which are products of the decay of organic matter. Artificial nutrients used in water cultures for plant production consist of soluble nitrates, phosphates and sulphates of calcium, magnesium and potassium such as nature provides from rotting organic matter. Commercial fertilizers contain the same type of materials.

To provide as much soluble nutrient in a mineral soil containing little organic matter, as nature releases in rotting compost would require more liberal use of commercial fertilizer than is often practiced, if indeed any rate of fertilization, however liberal, could take the place of an abundance of rotting humus. The most liberal use of fertilizer fails to give the high production of a combination of compost or other organic manure and mineral fertilizers.

Organic materials have an advantage over mineral fertilizers because not so much of their nutrient content is thrown into solution at once. Organic matter rots continuously providing a regular release of available nutrient through the season. There is little danger of burning the plant as too liberal use of soluble fertilizer may do, especially when periodic moisture shortages occur.

To fertilize the garden or field most effectively, a constant renewal of organic matter is essential. A ton of rich mineral soil in the field will remain a ton of soil even after many years of crop production. A ton of rich compost may become only half a ton in a few weeks and in the soil will

Reprinted by permission from the California Cultivator, Dec. 25, 1943

disappear nearly completely in a few years. Therein lies part of the virtue of organic matter. Rapid and complete decomposition liberates much plant nutrient. Although the mineral soil liberates more nutrient in the presence of rotting organic matter, the great mass of mineral matter persists indefinitely.

Organic matter may be effectively provided in the form of a mulch. The work of cultivation will be reduced by mulching with organic litter. Young grass as it comes from the lawn is excellent mulching material for quick growing plants. The more mature grass and volunteer growth that may be obtained from fence rows or vacant areas, is good for certain uses. Compost is another source of material that may be available. Straw and spoiled hay are good for use in the orchard.

Besides their mulching value these materials have a high fertility content. One hundred pounds of dried grass may contain 75 cents worth of plant nutrients at present prices. A two-ton mulch of legume straw or spoiled hay is equivalent to 400 to 500 pounds of fertilizer in nutrient value. As the mulch rots the soil is enriched to produce better crops. Quick rotting materials should be used for growing vegetables. Sawdust is good for mulching shrubbery but should not be used on the garden. There is little fertility in sawdust and rotting is too slow for much fertilizing effect.

The use of a litter mulch not only eliminates some of the tillage, but makes fertilizers more effective. The protecting mulch keeps the top soil moist where the fertilizer is placed. Surface feeding roots undisturbed by tillage provide nutrient absorption in the moist, rich soil through most of the growing period of the crop.

Surface soil protection by mulching results in increased surface root development. There is no decrease in depth of root penetration because of the mulch. With just as many deep roots and many more surface roots the plant is enabled to make rapid and vigorous growth, which is important to short season vegetables that must be ready for use quickly. The mulch helps to keep foliage and fruit clean on low growing plants. Rain or irrigation passes gently through the mulch and into the soil kept open and receptive by the protecting surface cover.

Because of the scarcity of materials, mulching is well suited to small areas such as the home garden. Berries and small fruits may be satisfactorily mulched. Orchards have been mulched with good results to improve the soil and increase the harvest. Mulching is adapted to intensive cul-

ture where precautions are taken against fire and other hazards resulting from the practice. A mulching program supplemented with fertilizer and with irrigation water, will maintain the soil in a state of high productivity.

Fall or early winter is an excellent time to use straw, leaves and other plant waste for mulching. Manure heaps should be removed and spread on the land, where the nutrients may pass into the soil for growing next season's crop. Coarse straw applied to the soil in the fall has time to partially rot before spring. When growth starts, the mulch will be sufficiently decomposed to supply nutrients for the crop.

New Sweet Clovers for Every Need

Condensed from Successful Farming

E. A. Hollowell

United States Department of Agriculture

"WHERE can I get the late-maturing, old type of sweet clover?" is one of the most frequent questions that is asked by Cornbelt farmers who have grown sweet clover in past years. Many farmers are accepting what is available on the market while others, becoming dissatisfied with the crop, are turning to other legumes such as alfalfa and red clover, not realizing that there are better-adapted, higher-yielding varieties than the common kinds of sweet clover. Three of these new, superior varieties—Evergreen, Spanish, and Madrid—have proved their value in extensive tests and are ready for rapid seed increase and farm trial.

As the name suggests, Evergreen, a variety of biennial white sweet clover, is the answer to the livestock feeders' need. It has the two characteristics of late maturity and vigorous growth. In the summer of the second year Evergreen provides grazing three weeks longer than common white sweet clover and this means green feed during July and early August when pastures are becoming short. The rank growth of Evergreen makes it a high yielder, and the stubble left after grazing may be plowed under for a seeding of winter grain. Evergreen blooms over a long period of time, and while seed setting is good, large seed yields are seldom obtained due to the shattering of the early-

Reprinted by permission from Successful Farming, Jan., 1944, Des Moines, Iowa

formed seed or the immaturity of the late seed (depending upon when it is harvested), and to the lack of a satisfactory machine for handling the rank growth. A new, simple device for attachment to a corn binder, developed by the Ohio Station, makes the binder adapted to seed harvesting of broadcast plantings. This attachment, plans of which are available, may be in part the answer to past difficulties.

Evergreen is well adapted thruout the Cornbelt and the eastern edge of the Great Plains States. The frequent periods of drought and high temperatures of the Plains States cause low seed yields or seed failures. Evergreen was bred by the Ohio Agricultural Experiment Station but only a small quantity of seed is being raised, due to harvesting difficulties. Preliminary seed-production trials indicate that large yields can be obtained in the Intermountain States, and seed from this region may supplement what can be grown in the Cornbelt States. At Columbus, Ohio, Evergreen has yielded slightly over a ton more of dry forage per acre than common biennial white, while at Lincoln, Nebraska; Manhattan, Kansas; and Ames, Iowa, it has yielded nearly a ton more per acre. Due to its coarseness of growth it makes a poor-quality hay.

Spanish, also a variety of biennial white sweet clover, is a midseason-maturing variety, being somewhat later than commercial common biennial white. It has remarkable, early-seedling vigor and is somewhat tolerant to heavy fall frosts. It is a heavy seed producer, and excellent yields of seed are obtained thruout the Cornbelt and eastern part of the Great Plains. At Lincoln, Nebraska, it has outyielded common biennial white in forage by one-third ton per acre and has yielded more than common at Ames, Iowa; Columbus, Ohio; Manhattan and Hays, Kansas; while at Pullman, Washington, it has been outstanding.

Madrid is an outstanding variety of biennial yellow sweet clover. Madrid combines high yield with early seedling vigor, and of all varieties studied is the most tolerant to heavy frosts in the fall of the first year. It has produced from a quarter ton to over a ton of dry forage per acre more than common yellow at the experiment stations mentioned above. Madrid is a heavy seed producer, maturing slightly later than common yellow, but is sufficiently early to escape the drought hazards of the Plains region. At the Southern and Northern Great Plains stations and the Hays, Kansas, Experiment Station it has been outstanding and in the Cornbelt it is superior to common yellow. Spanish and Ma-

drid sweet clovers were introduced by the Bureau of Plant Industry, Soils, and Agricultural Engineering, the seed originally coming from Spain.

In addition to Evergreen, Spanish, and Madrid, the varieties Sangamon, developed by the Illinois Station, Wisconsin Late from the Wisconsin Station, and Iowa Late from the Iowa Station, mature later than most of the common types on the market. Other new varieties are in the making and these will be lower in coumarin, the substance causing the bitter taste of sweet clover; some will be more leafy with smaller stems while others will be disease resistant, particularly to root rot which frequently causes stand losses during the early spring of the second year.

Soon after the close of World War I the status of sweet clover rapidly changed from that of a weed to a most excellent plant for green manuring and temporary pasture in the Cornbelt States. In the Great Plains States its drought-tolerant characteristics after seedling establishment gave an incentive for a rapid expansion in acreage for hay and pasture. During the 20's the seed was mostly produced in the same places where used. During this same period sweet clover was found to be ideally suited as a rotation crop in the spring wheat and potato belt of western Minnesota and eastern Dakotas, and weather conditions were conducive to the harvesting of large seed yields per acre. With the advent of the combine, seed harvesting became an easy task, and the sale of seed added considerably to the farm income of that region.

The early-maturing, semi-dwarf types proved to be superior for combining and gave high seed yields because these types ripen more uniformly. As time went on the farm prices of sweet-clover seed dropped and the Cornbelt farmer produced less seed, depending upon other sources for his needs. During the past 10 years the states of Minnesota and North and South Dakota have often produced nearly one-half the total annual seed harvest of the United States. Since common biennial yellow has approximately the same maturity as the early-maturing white-blossom types, it became mechanically mixed with the white blossoms, and in recent years much of the sweet-clover seed has become a nondescript mixture. When five percent or more of yellow-blossom seed is mixed with white-blossom sweet clover and is shipped in interstate commerce it must be labeled sweet clover without designation as to kind to comply with the Federal Seed Act. Thus a large part of our sweet clover is either the early-maturing white or is a

mixture of white and yellow blossom. It is not as productive as the sweet clover formerly grown in the Cornbelt and is less desirable for grazing because its early maturity makes the length of grazing season much shorter.

The growing of these new varieties for seed offers several problems that must be met in order to keep plant characteristics that make for superiority. Volunteer plants from hard seed of the common kinds that were previously grown is one source of contamination. Cross pollination between plants by bees brings about the mixing of common qualities with the superior ones. Since seed of these varieties cannot be distinguished from common varieties by appearance, the use of certified seed is recommended.

The seed of Evergreen, Spanish, and Madrid will cost more than common seed because added work is involved in keeping it pure, and for the services of certification, but the greater yields are worth the 60 to 70 cents per acre cost over that of common seed. The seed supply of these new varieties is limited at this time. However, efforts are being made by many state crop-improvement associations to increase the seed stocks.

Substitutes for Oyster Shell

Where transportation difficulties have put oyster shells beyond the reach of poultrymen, local products are recommended. Tests by J. Holmes Martin, head of the Purdue Poultry Department, indicate limestone grit and marls to be a good source of calcium for laying hens, provided they do not contain in excess of five percent magnesium carbonate. Place an additional box or hopper of limestone close to the feed hopper or drinking fountain to stimulate consumption, which will be less than where oyster shell is used.

—*Successful Farming*

Hard Coal Ashes Improve Heavy Soils for Tomatoes

Condensed from Farm Research

Charles B. Sayre

VICTORY gardeners who have struggled with very heavy soils which become hard when dry and exceedingly sticky when wet may be interested to know that such a soil can be greatly improved for growing vegetables, flowers, or grass and the soil will be much easier to work if anthracite coal ashes are thoroly mixed in the soil. Altho this fact has been known for some time and put into practice by gardeners, a test conducted in the greenhouses at Geneva this year illustrates the marked benefit from mixing anthracite ashes in a heavy soil. This test was an outgrowth of a study of different starter solutions for tomatoes on different types of soil.

One of these soils was Ontario loam, a moderately heavy, nearly neutral soil, from a field near Geneva. The other soil was Fulton silty clay from the Vineyard Laboratory farm near Fredonia in Chautauqua County. This soil was extremely acid, having a pH of only 4.8. It was very sticky when wet and became very hard when dry. That it was poorly aerated was shown by the mottled gray, brown, yellow, and red coloring that was apparent when the soil was spaded or plowed.

"Starter" solution tests showed that the Ontario loam soil was much more congenial for the tomato plants, and in all 23 treatments the plants became established quicker and grew more rapidly in this soil than they did in the Fulton silty clay. On the Fulton soil the roots were all near the surface, while on the Ontario loam they grew deeper and permeated the soil uniformly.

To determine the reason for the poorer growth in the clay soil, a comparison of four soil treatments was made in the greenhouse.

In addition to untreated checks, each soil received the following:

A. Sifted anthracite coal ashes applied to the soil at the rate of 10 tons per acre and thoroly worked into the soil to a depth of 6 inches. The anthracite ashes were used because they would loosen or lighten the soil and improve its aeration without affecting its acidity or fertility level.

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The 10-ton rate made a layer of ashes approximately ½ inch deep when spread over the surface of the soil before mixing it in.

B. Hydrated lime at the rate of 4,500 pounds per acre thoroly worked into the soil to a depth of 6 inches. It was calculated that this amount of hydrated lime would reduce the acidity and raise the pH of the Fulton clay soil to 6.5 which is considered to be a very favorable pH for plant growth. Lime also tends to improve the aeration of a heavy soil by causing the fine soil particles to clump together.

C. Both hydrated lime at the rate of 4,500 pounds per acre and sifted anthracite ashes at the rate of 10 tons per acre worked in thoroly. This treatment corrected the extreme acidity of the soil and also loosened it so that the aeration was greatly improved.

Two weeks after these amendments had been applied to these soil, tomato plants were transplanted to each lot. The plants were 6 weeks old and were carefully selected for uniformity of size at time of transplanting.

It soon became apparent that the coal ashes, treatments A and C, had a very beneficial effect on each soil type. The plants growing in the soils that received the A treatment (10 tons coal ashes) and the C treatment (10 tons coal ashes plus 4,500 pounds lime) grew much more rapidly and were a darker green color than the other lots. The latter treatment seemed especially favorable. The plants in the Fulton clay receiving this treatment grew almost as vigorously as any of the lots on the Ontario loam soil. On each soil the best growth was obtained from the C treatment and the poorest growth from the untreated soils. The A treatment (ashes only) was second best in each soil and the B treatment (lime only) was a rather poor third.

Apparently the principal cause of poor growth in the Fulton silty clay was lack of aeration, because the anthracite coal ashes did not change the acidity of the soil but merely lightened it and improved its physical condition. The B treatment (lime only) which corrected the acidity of the soil also improved the physical condition slightly. This treatment produced some improvement in the growth of the plants but was not equal to the improvement shown by the A treatment (ashes only). The best growth, however, occurred in the C treatment (10 tons coal ashes and 4,500 pounds hydrated lime). This treatment corrected the acidity of the soil, lightened it, improved the aeration of the soil, and made it very congenial for the rapid growth of tomatoes.

Some plants were taken up carefully 16 days after they had been transplanted to these differ-

ent soil treatments. The soil was washed off the roots to note the difference in development of the root system. The plants grown in the untreated soil were much smaller and more spindling and the foliage, especially the lower leaves, was more yellow, than any of the other lots.

Judging from the increased growth of the tomatoes, both soils were greatly improved by the addition of the anthracite ashes. Since the coal ashes did not add any fertility to the soil nor correct the acidity, the beneficial effect must have been due to the improvement in the physical condition and better aeration of the soil.

Dr. F. W. Went of the California Institute of Technology has shown that a growth factor similar to a hormone, which he calls "caulocaline," is produced by tomato roots and is essential for stem growth and the prevention of chlorosis. His experiments showed that aeration of tomato roots is especially important for ample production of caulocaline which stimulates the growth of tomatoes. This may explain the marked increase in growth of tomatoes where anthracite ashes were mixed in the soil.

Victory gardeners with a heavy soil and the prospects of an abundant supply of anthracite ashes this winter might wonder how much ashes can be utilized to advantage in the garden. The experience of a number of gardeners has shown that a layer of screened ashes 2 inches deep can be used to advantage if the ashes are well worked into the soil to a depth of 6 inches or more. There's danger of toxicity if bituminous ashes are used.

The Salt Requirements of Live Stock

Condensed from New England Homestead

Edward B. Tustin

ALTHOUGH all Farmers realize the necessity of salt for every type of stock, many do not realize that salt must be fed to the animal regularly, just as lubricating oil must be supplied consistently to a machine; otherwise, there will be trouble.

Salt is continually being given off by the animal body. Horses put two grams of salt into every pound of perspiration. Cows put a gram of salt into every pint of milk. Chickens put salt into their eggs and sheep salt into their fleece. With this in mind, it is remarkable to note the benefits to be derived in promoting the health and development of stock from the proper use of salt.

Poultry

Take chickens, for example. Agricultural Station reports show that groups of poultry not receiving salt are characterized by poor growth, inefficient utilization of feed, increased susceptibility to disease, retarded sexual maturity and a decrease in the size of the eggs and the number of the eggs. For these reasons salt is included in prepared feeds; so if you mix your own or have it mixed for you, put in 1 lb. of fine salt, preferably iodized, to each 100 lbs. of mash. The reason for iodized salt is to replace the iodin of the missing fishmeal these days.

If chicks become cannibalistic, a highly effective control, reported by Wisconsin University, is to provide extra salt by dissolving a tablespoonful of fine salt in a gallon of water. Give for a half day on three alternate days; for instance, a half day on Monday, Wednesday and Friday.

Hogs

Of all classes of live stock swine suffer the most from lack of salt. This is because their growth is so rapid and they are often raised without pasture. Very important savings in feed and maturity time results from mixing 2½ lbs. of salt in every 100 lbs. of the meal. Tests from Canadian Experiment Station Reports show that pigs fed 2½% salt produced 20% more gain than a check group given but 1% salt in the meal. Furthermore, judges said the fat and meat was harder in the heavier salted pigs. Use a rather fine salt. It mixes better.

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Dairy Cattle

Cows in milk, calves, rapidly growing heifers and pregnant animals have a high salt requirement. Tests on 250 cows over a two year period at the New York World's Fair showed they should *have all* the salt they want. A good practice is to mix 1 lb. of fine salt with each 100 lbs. of grain and then provide extra salt free choice where cows can help themselves to what they want, as salt needs vary widely with individual cows.

Steers

Beef stock need plenty of salt. The greater the proportion of roughage in the feed, the greater the amount of salt needed. Seeds and grass are low in sodium and chlorine. Roughages are all deficient in sodium. Salt, of course, is composed of sodium and chlorine and so will supply these elements. At the Kansas Station, on grass pasture steers consumed 1½ lbs. of salt per month; on alfalfa hay 3 lbs. per month, and on corn silage over 9 lbs. per month. Salt that is made constantly available to live stock automatically takes care of their varying requirements.

Sheep

Sheep and lambs have a higher salt requirement per pound of body weight than any other farm animal. This is due to the larger amount of roughage they eat and to the salt lost in perspiration. They should have salt in covered boxes near watering places to take at will. Lambs will consume almost a half pound of salt a month; ewes a pound.

Horses

A reasonable allowance is about two ounces per day or a little less than a pound a week, as shown by tests at the Michigan Experimental Farm. The quantity needed varies with individual horses and with the season, increasing from May into September.

It is said that one of the most frequent causes of excessive loss in weight and fatigue in horses during the haying season is due to insufficient salt. When the weather is cooler and work and perspiration are less, the need for salt is less. Horses should have free access to salt at all times in pasture, paddock and feed boxes, so they can adjust their requirements to their needs. In many instances delicate eaters and shy drinkers will show an increased appetite when allowed free access to salt.

Buying a Farm or a Heartache

Condensed from Capper's Farmer

Francis Kutish

Iowa State College

THE question of whether land is too high would have brought forth snorts of laughters back in 1920. "Nonsense. Why, in a few years it will double its value," people would have told you.

Thirteen years later, in 1933, it is doubtful if you could have found one person who would admit ever having made such a statement. The mortgage foreclosures of the intervening years toned down that optimism considerably.

Once again, in 1943, the "land bug" is biting. Newspapers are playing up land sales. There are reports of $200 an acre farm deals in Iowa while some land in Illinois has brought $250. In the Southwest, ranches have been sold at 2 to 3 times what similar property was bringing not long ago.

Are such prices justified or do they forecast another series of foreclosures and heartaches like the one we sowed during the last war and harvested in the late 20's and early 30's? It has been said that the last land boom caused more ruined homes in the Midwest than did the war.

The biggest problem facing anyone planning on buying a farm today is "how much can I afford to pay." Making a mistake in buying a farm is likely to result in years of wasted effort and loss of hard-earned savings.

Buying a farm is a gamble that prices, together with production from the farm, balanced against costs will leave the buyer enough for a living and still pay out on his obligation. Therefore the answer to the problem of "how much can I afford to pay" depends largely upon how good a job you do in estimating what the future holds, both in the way of prices of farm products and the amount of production from that particular farm.

Suppose you have found a farm that looks good. What is it worth? At one time you could have driven out to the farm, looked at it—and then guessed. That was called "windshield appraisal." Bitter experience taught us that a

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sound valuation of a tract of land cannot be determined in this haphazard way.

The real or fundamental value of any farm depends on the income it will produce. This, in turn, is determined by its production of crops, both kind and amount, and the type and amount of livestock it will handle. The latter depends upon the proportion of permanent pasture to crop land and the location of the farm —whether it is near a market so dairy cattle can be kept, etc. A third important factor is the satisfaction the farm will yield as a home.

The first step in determining the value of a farm is to estimate what it will produce. Find out which soil types predominate. What is their natural productive ability? Is the land run down or highly fertile? What is the "lay of the land"? Are there any sand pockets on this farm? How much land can be cropped? Is it well drained? What is the annual rainfall?

These factors must be taken into account in deciding how often the farm can stand corn or whatever may be the main crop. Can corn be planted 1 year in 5, or every 2 or 3 years? How many bushels per acre or tons of hay will the farm yield? How many livestock will the pasture support? When this is settled, income can be estimated. From the income your anticipated expense such as taxes, upkeep and insurance can be subtracted to get expected net income.

To arrive at estimated income from the farm, production must be multiplied by price. But what price? When? This involves the "times." What prices can we expect in the future?

Times are good now and prices of farm products are high because of war. This is in sharp contrast to the early "30's." Farm product prices are reflected in land prices, and the bitter experience of that period forced land prices down too low from a long-time standpoint. Accordingly, some land valuation rise was merited. This was taking place slowly before the war started.

Some rise in land values is justified in periods of high prices such as now exist, but the increases should be based on a careful consideration of how long the high prices will last. Land values on many Iowa and Illinois farms are now as high or higher than those justifiable in the long run, unless we are to have a permanently higher farm price level. Yet, there is every indication those states are due for a further rise in land prices. Farmers are buying land. So are city investors. Competition for land is outstripping the supply in many areas and prices are rising.

The most successful profes-

sional real estate appraisers now follow a general scheme of valuing land that really is not difficult. As one appraiser in central Iowa put it: "When I value a farm I just calculate how much rent a tenant could afford to pay on that place over several years. To do this, I estimate how much corn and oats he would have to sell. I figure the value of the hay and pasture land to his livestock. I use average prices such as one could expect over a period of years, not current wartime farm prices.

"Suppose that on that basis I figured a man could pay $8 an acre rent. This $8 is not all clear to the owner. He must deduct expenses—taxes, upkeep, insurance, etc. Let's say they totaled $3 an acre. This would leave $5 an acre clear.

"Now I figure money should earn 4 per cent interest. A net return of $5 an acre, capitalized at 4 per cent, amounts to $125 an acre, and this is the value I place on the farm. In other words, $5 is a 4 per cent return on $125. Since I can only anticipate a net return of $5 an acre, if I pay any more than $125 an acre for this farm I must expect my money to yield less than 4 per cent."

Such a method of valuing land places a premium on "foresight." Too many people tend to base land values solely on present or very recent farm product prices. For that reason, the farther we get from a period of low farm prices, the greater the danger of rapidly rising land values.

Suppose you have placed a value on the farm at which you are looking. Many other decisions still remain. These include the size of down payment, rate of interest, size of annual payment, extent to which payments in advance will be permitted, the effect of delinquency on the purchase contract and the danger of cutting into liquid capital.

And for each individual case the answers to these decisions are different. Generally speaking, the man buying a good farm can make a proportionately smaller down payment than he can if he is buying a poor farm. A good farm will produce more income for the same labor than will a poor farm. This leaves a larger amount of money available to meet interest and principal payment after operating costs are paid. Here is a fact many people apparently fail to recognize. Net income per acre available for family living and payment on the mortgage rises much faster than total income as you move from poor to better land.

If the amount of down payment is too small, interest payments on remaining indebtedness may eat up all your income. Unless the prospective net income on a farm is sufficient to cover

living costs of a family plus the required annual principal payment and interest on outstanding indebtedness, a buyer is only looking for trouble—trouble he will easily find.

Many credit agencies now are making farm real estate loans at 4 per cent interest. While a slightly higher rate than this is required where only a small down payment is made (since risks of the lender are somewhat higher), a rate very much out of line with this on Corn Belt farms is too high. If some safeguards to the buyer's equity are included in the contract, he might find it advantageous to pay a slightly higher rate of interest.

If the contract does not permit advance payments on the loan at anytime the buyer can do so, it should not be considered. It is the buyer's duty to himself and to his country to pare down his obligation to a reasonable figure. This principle is recognized by most insurance companies making farm loans. Almost all of them encourage reduction of the principal on farm mortgages. Annual payments are required in most land contracts and mortgages involving indebtedness. This acts as a safeguard for both the borrower and lender. Most people consider an annual principal payment of around 2 per cent of the original purchase price fair, altho some provisions should be made for changing this in periods of abnormally high or low prices.

A big problem facing any prospective farm purchaser, particularly one with resources for only a relatively small down payment, lies in the danger of cutting down on the operating capital with which he has to work. If a man can raise money for his down payment only by selling livestock or equipment to the point where he will reduce his production of essential foods, it is questionable if he should buy that farm.

Certainly no one benefits when a farmer, to buy a farm, reduces his working capital so he seriously impairs his earning ability and makes it impossible to pay out. Equally as bad he enters the next year without a bit of reserve to meet his payments should he experience poor crops. That is highly dangerous. The importance of maintaining a good supply of working capital is apparently not sufficiently recognized by most farmers.

So, if you finally decide to buy a farm at this time, use some of your income to build up a reserve to meet your payments when a bad year comes along. You can invest this reserve in War Bonds. Next, use as much as you can to pare down the indebtedness while still maintaining your production.

Spray Rigs for Fire Fighting

Condensed from Electricity on the Farm

George W. Kable

FOG—that high pressure mist that thousands of farmers apply to their fruit trees and potatoes—is commencing to be recognized as one of the most effective agents in putting out fires. This should be good news to farmers and to insurance companies. It can be good news with a kick-back if the presence of a spray rig on a farm gives a false sense of security, merely by its presence. To be effective it must be ready always for instant use.

About 200 farm buildings in the United States and Canada burn every day. The annual money loss is around $100,000,000, about one-third of the total national fire loss. The wisest and safest thing to do is to take precautions and use care to prevent fires. For the fires that do occur, a consideration of the spray rig for fire fighting deserves attention.

A fire is started whenever a combustible material in the presence of oxygen reaches the kindling temperature. It will continue to burn as long as there is oxygen and the temperature remains above the kindling point. It will go out if you can smother it or reduce the temperature below the burning point.

High pressure fog is effective in putting out fires because it cools the fire quickly and blankets it with steam. The fog used for fire fighting is most effective at about 600 pounds pressure at the nozzle or at the higher spray rig pressures. The water particles in such a fog are very fine, and every particle has a chance to come into contact with the fire. What then happens is that each little particle is changed into steam and in making this change it takes up enormous quantities of heat—enough to cool the fire so it will go out.

There are other distinct advantages in fighting fire with fog nozzles. The high pressure pushes the fire and smoke ahead of it so a man can walk up close to a fire to fight it. Because of the cooling effect of the small particles, it is claimed that only 1/35 to 1/10 as much water is necessary as is needed with a low pressure stream of water. This means that there is much less water damage to furniture and furnishings. The fog also gets the blaze under con-

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trol quickly, with the result that fires may be put out with only a fraction of the amount of water that would be needed by a bucket brigade or through a hose at ordinary pressure. The very high pressure of the nozzle also has some effect in blowing out the fire.

In a report of the Michigan Agricultural Experiment Station it is stated that "demonstration fires have been brought under control or to smouldering embers in from 30 to 60 seconds by using only 20 to 30 gallons of water."

Fog has been effective on most types of fires, even gasoline fires. By using a nozzle which can be adjusted to deliver a high pressure solid stream or a fog, the fire may be blown ahead with pressure and then cooled and smothered with fog. So effective has this been, that some spray rig factories are now devoted almost completely to the building of crash trucks for air fields. Many fire departments are also acquiring high pressure equipment.

In the hands of a trained fireman, or even when pointed by an orchardist, a high pressure fog gun is an effective piece of fire fighting equipment, *IF it has pressure behind it* and is ready when the fire occurs. Therein depends whether farm spray rigs are or are not good fire fighting equipment.

Electrically operated stationary spray rigs which are usually located in the farm buildings, should furnish excellent fire protection. Portable spray outfits can furnish good fire protection if they are so placed and equipped that they can be quickly put to use when a fire occurs.

It is customary to thoroughly clean and drain the spray pump, tank and hose lines when the spraying season is ended. If the spray equipment is to serve as a fire fighting unit, it must be kept full of water or be so placed that it can be instantly filled from barrels or tank. The pump must be oiled and in good working condition, and the power to drive it must be tuned-up ready to start quickly.

If the pump is driven by an electric motor as regular equipment, or is equipped with a motor for standby fire service, it will be ready to start quickly. The wiring should be located so as to be least susceptible to injury in case of fire. If a gas engine is to be depended on for power, it should be kept in good running condition and started once every month or oftener for a test run. If the rig is of the type that is driven from the power take-off of the tractor, then the tractor should be housed with the rig and be hooked up in readiness to run.

In freezing climates there is the problem of having water quickly available when needed. There are two solutions for this. The best

one is to keep the filled tank in a warmed building. The other is to have barrels of water containing calcium chloride to keep it from freezing, ready to dump quickly into the tank. This is not so good, as the calcium chloride tends to rust the tank and pump, nor is it desirable to use on upholstered furniture, radios, metals, etc., when fighting fire. If you do not have a warm building at home, consider the possibility of placing your spray rig in the nearest fire hall or on some neighbor's farm. If used for fire protection, it will be more in demand in the winter than in the summer.

Sprayers mounted on iron wheels without springs are not made to be moved rapidly over rough roads. Fifteen miles per hour is probably the limit without shaking them to pieces. This must be borne in mind. The boom on potato sprayers should be removed at the end of the season and a hose connection provided.

Farmers who wish to use their sprayers for fire protection should try them out on brush or other fires to get the "feel" of operating them and applying the fog in the best manner.

The spray rig is potentially an excellent piece of fire fighting equipment—better than some towns have. The difficulties of having it always in readiness for use so it will give you actual and not just potential protection are real and call for some effort and advance preparation. The difficulties of replacement of burned stock, feed, building and people is even more real these days, and warrants the necessary effort. Just don't be caught thinking you have protection when your spray rig is not ready to produce the fog that puts out the fire.

Even if you have a spray rig, you had better keep the garden hose close to a hose-bib on your water system. A *small fire* is easy to extinguish, and a handy hose may do it in less time than it takes to start the spray pump.

If you count on your sprayer for fire protection, be sure.

1. That it will be ready when needed.

2. That there will be someone available to operate it.

3. That you have other protection if either of these fail.

Flock Mating Test Points the Way

Condensed from New Jersey Farm and Garden

C. S. Platt

WITH the close of the first year of the New Jersey Flock Mating Test, records of a new type were established that may be difficult to equal for some time to come. This test differs from the ordinary type of egg laying test conducted in New Jersey in that the results are measured on the basis of economic returns and the entries are restricted to pullets that are fairly representative of the general run of stock on the owner's farm. The latter condition is brought about by the fact that the pullets entered must have come from chicks hatched out of a collection of 100 eggs taken at random from the various mated pens on the farm.

In the spring of 1942 eggs were collected on this basis, hatched under supervision, and the resulting chicks wingbanded. In the fall of that year pullets bearing corresponding wingband numbers were entered in the Flock Mating section of the Passaic County Egg Laying Test and carried through until September 22 of the present year. As only sixteen pullets were required for an entry, it is probably true that they were more selective than would be found at the home of any one contestant; but at the same time all of those who had birds entered in the project were on an equal basis in so far as the original selection of the 100 hatching eggs was concerned.

The percentage of hatch as well as the method of rearing all were factors in the results obtained, because men who were the most successful in the hatching and rearing of young stock naturally had a chance for better selection of sixteen pullets when the time came to make the entry. The project, therefore, measures not only the possible breeding value of the stock entered but also is some indication of the conditions under which the pullets were reared. After they were mature and sent to the egg laying test, all the birds received the same care and management, which suggests that the results obtained were due to factors inherent in the stock when it reached the age of laying and was subjected to the official test. Fourteen pens with a total of 224 birds were entered in the project.

The average gross return per bird from the sale of eggs during the year was $7.14, the cost of feed $2.37, leaving a return over feed cost of $4.77. When the increase in the value of meat dur-

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ing the year was added to the net return from eggs, a total of $4.93 was realized as the full return over cost of feed for the average bird in the test.

The high pen, a White Leghorn entry, exceeded the average by a considerable margin, with a gross value of eggs of $8.98 per bird, feed cost of $2.52 and a return over feed cost from eggs alone of $6.46. With the increasing value of meat the net return in the leading pen was $6.84 per bird. This is a record that probably will not be equalled for some time to come, as was suggested above. It was outstanding even in this particular year, as the second ranking pen returned almost a dollar less per bird. There was a greater difference in net income between the first and second pens than between the second and the tenth. This suggests that the stock in this entry clearly was outstanding, and it will be of interest to see whether or not entries from the same source will continue at that relatively high level from year to year.

In a detailed study of the differences between the various pens some interesting facts have been observed, one being that the chief cause of difference has been the productive quality of the birds, with mortality holding almost an equal position in its effect upon the economic returns. The percentage of large size eggs produced did not seem to have much influence upon the results, as in only one case out of the fourteen was it a factor in the relative ranking of a particular pen. The amount of feed consumed by the birds likewise seemed to be unimportant, despite the fact that both heavy and light breeds were involved in the test. In only one case out of fourteen did it have a direct effect upon the rating. In no instance was the increase in meat value of outstanding importance, although to a certain extent it naturally had a relationship to mortality as pens with the greatest loss of birds showed the greatest loss in value of poultry meat throughout the year. In spite of what has been said in recent years regarding egg size, it would seem far more important for poultrymen to pay attention to the productive quality of their stock, coupled with its ability to live, rather than to worry too much about the quality of eggs. Even the amount of feed consumed is relatively unimportant when heavy breeds that have been bred for production can hold their own with Leghorns in net returns even if they do consume more feed.

Studies of the feed consumption records have brought out interesting observations, namely, that in every pen regardless of the rate of production approximately the same quantity of mash was required for every dozen eggs pro-

duced, that is, about two pounds. This would suggest that mash consumption is regulated by the birds in accordance with their needs and that if they are bred to lay they will consume the mash necessary to furnish them with the essential nutritive factors. There was some variation among the pens, perhaps enough to suggest that it may be possible to breed strains of poultry that can produce eggs at very efficient levels of mash consumption. Evidence on this point would need to be rechecked for several years, however, and it would not be sound to attempt to draw inferences from the results of only fourteen pens in one year.

Considering productive factors alone, regardless of the economic relationships, the leading pen produced an average of 246.2 eggs per bird on the basis of the sixteen birds entered, and the poorest pen 106.3; the average production of the test was 197.1 eggs per bird. Of all the eggs produced, sixty-seven per cent were graded as extras; thirty per cent were graded as mediums; and three per cent graded as pullets. From the standpoint of egg size, the fourth ranking pen had the largest eggs with eighty-four per cent grading extras, fifteen per cent mediums and one per cent pullets. On the other hand, the pen holding fourteenth place had eggs that graded only twenty-nine per cent extras, sixty-three per cent mediums, and eight per cent pullets. This noticeable difference in the quality of the stock entered from various sources suggests that there may be room for some real practical research on the factors of management being followed on farms in New Jersey and their relationship to the quality of pullets reared. Just how much of a difference is due to breeding of the stock and how much to environment during the brooding period is impossible to measure from one year's study, but it is conceivable that entries could be obtained on a check basis from various parties who have purchased chicks from the same source, thus perhaps keeping the breeding factor under control and noting the effect of rearing environment. Possibly greater value could be obtained from this particular project if a man was permitted to enter all of the pullets he had raised from a given sample of chicks rather than to limit the entry to sixteen birds.

While the profits at the present time are relatively high in the poultry business, there is every reason to believe that this condition will not hold true for many years, and the man in the future who expects to maintain his poultry farm will need to have a well-developed program of breeding and rearing if he is to secure a satisfactory income. Fifty pens a

year for five years could be a source of extremely valuable information if entries could be obtained that were representative of stock as it is actually bred and reared on the poultry farms in the state.

In line with the observation that the laying test might be of value for practical use to the poultry industry, a description of the feeding and management methods used would appear desirable. As is common practice, a dry mash was available at all times. No moist mash was fed throughout the year, although water was sprinkled on the dry mash at noon for a period in the latter part of August and during September. Two distinct mixtures were made, one being used as a basis for the mash from October 1, 1942, to March 1, 1943. At that time, in line with recommendations for the conservation of the animal proteins, a change was made and a mixture adopted that was continued for the remainder of the test year.

The grain mixture consisted of 400 pounds of cracked yellow corn, 400 pounds of wheat and 200 pounds of oats from October 1 until the following August. After that time the mixture was variable, depending on what could be purchased, usually consisting chiefly of wheat with the addition of a small quantity of barley and oats and occasionally a little cracked corn. The grain was fed during the fall and winter on the basis of giving the birds all they cared to eat in the late afternoon and again the following morning. As a matter of fact, hoppers were used, the lids being opened at 4:00 in the afternoon and closed at about 8:00 the next morning. During the late spring and summer months the lids on the hoppers were open for only an hour or two in the late afternoon, the birds thus having no grain in the morning. During the colder season of the year, additional grain was fed at noon at the rate of three pounds for each hundred birds daily; this was scattered in the litter. The same procedure was followed in all pens regardless of the breed. This system of feeding resulted in a considerable quantity of grain being consumed, the average per bird for the year being 56.1 pounds of grain and 36.4 pounds of mash, a total of 92.5 pounds of feed.

Artificial light was used from October 1 until May 1 and again from August 1 until September 22. The system followed during the winter was to maintain a fourteen-hour day with the actual timing of the lighting adjusted twice monthly in accordance with the hours of sunrise and sunset. In the summertime the lights automatically turned on at 4:00 A.M. and continued until daybreak.

Definitions of Conservation Farm Practices

Reprinted from The Bulletin of the Garden Club of America

Prepared by Morris L. Cooke and Revised by Hugh Hammond Bennett

Contouring — Plowing, planting, cultivating, and harvesting sloping fields, on the level; that is, farm *around* the hillside with bending furrows to fit the curvature of the land, rather than up-and-down the slope, in straight rows. This contouring, the furrow depressions and ridges, intercepts run off of rainfall, retains it and stores it in the ground, while at the same time greatly reducing the quantity of soil running off in the water that goes downhill.

Terracing — Ridging land on the contour; that is, building up moderate embankment barriers across sloping fields to intercept and slow down run off water and guide it safely to be disposed of at the sides of fields. This slowing down of the rate at which excess rainfall flows off the land also slows down the rate of soil removal, as in the case of contouring.

Strip Cropping — Planting alternating bands of close growing vegetation with similar strips of clean tilled row crops, on the contour, so that the strips of close growing plants form a safety belt and water run off between the cultivated strips. The dense non-tilled vegetation obstructs and impedes the rate of water flow and so reduces erosion in the cultivated strip next below.

Crop Rotation—Systematically alternating the production of various adaptable crops on a given piece of land, so that the condition of the soil may be improved by one crop for the next following crop, as, for example, where the important plant food, nitrogen, is added to the soil by a leguminous crop (which has the power to take nitrogen out of the air) for the benefit of a succeeding crop that does not have the capacity to fix nitrogen, such as corn and cotton.

Cover Crops—Growing close growing crops which form a cover over the soil at the season of the year when no other vegetation protects the land against wind and water erosion. According to the species of the plant and the time of year, the cover crop may be a winter annual, a summer annual, or a perennial.

Mulching—(Called, also, stubble mulching, trashy cultivation, subsurface tillage.) Leaving crop residues or stubble on the surface, rather than burying them with turning plows. This surface

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mulch of vegetal material serves to protect the soil against erosion and baking, increases absorption of rainfall, and favors development of a good soil structure by encouraging the growth of beneficial microscopic organisms. Cultivation used in connection with this kind of farming involves use of plows that don't completely turn the ground upside down.

Drainage — Artificial removal of excess water from the land through such means as open drains (ditches) and underground installations (tile drains). The practice involves keeping such waterways free of any obstructing material or growth, so the drains will function.

Protected Waterways—Installation of carefully located field drainageways, stabilized against erosion with dense permanent vegetation (as grass, legumes, and vines), to dispose of water from the field terraces and contoured furrows without formation of gullies.

Gulley Control—Establishment of adaptable vegetative and mechanical measures for stabilizing eroding gullies. This is accomplished usually by reducing the rate of water flow within the gulley or by directing water from the heads and sides of gullies, making use chiefly of dense growing vegetation, as grass, vines, trees, and shrubs, and by the use of flumes and resistant platforms to lessen the impact of waterfalls.

Water Spreading — Controlled distribution of run off water, either directly at the foot of slopes or from storage reservoirs and basins, over favorably associated tracts of land, by means of water-spreading. This is done by intercepting and distributing diverted run off water with dykes, dams, and other practical means for carrying water from one place to another. The object of water spreading is to make use of water in low rainfall areas by spreading it over fields and pastures to soak into the ground rather than allow it to run to waste.

Better Land Utilization—Using every acre according to its particular capability to produce and keep on producing; based fundamentally on such physical factors as type of soil, degree of slope, character and extent of erosion, and climatic conditions. Accomplishment is achieved by using all the land, including parcels of land often neglected or unused, for trees, grass, wildlife refuges, and the like, thereby getting production out of all the land rather than permitting some acres to lie idle. Also, involves using land for the crops it is adapted to grow abundantly rather than for crops that will have no more than a chance of producing good yields.

Avoiding Avoidable Losses

Condensed from The Ayrshire Digest

T. P. Whittaker

CASUAL observations at the farms of men who have been very successful, not to mention those who have not done quite so well, raises a question of whether it isn't the mole hills that cause rather serious "profit-stumbles."

Only a few days ago I was in the No. 2 barn at a farm that I visit frequently and observed a dry cow with a badly swollen udder. The reason — a heifer's stanchion came unlocked because a spring had dropped out. The heifer had very pointed horns and had disastrously used them on the rear udder of a good cow. Possibly she'll come along all right but if not, a cow that was classified "Very Good," has very creditable records and is a member of a rather exceptional cow family will have passed on. Sort of like the story that goes: "For the want of a nail the shoe was lost; For the want of the shoe the horse was lost; For the want of the horse the battle was lost, and all for the want of a horse shoe nail." In this case it was a pin in the stanchion catch.

On this same farm it was once the practice to go over the herd every fall and saw the tips (sometimes as much as two inches) off horns that were inclined to be rather pointed. As long as the job was being done and there was no evident horn damage the benefits of the practice were minimized. One night in December (referred to above) they were again maximized and the hack-saw treatment of the fine pointed horns is being re-established.

For many years on another farm where heifers were generally stalled during the winter months, a "lice" hunt has been one of the first bad weather jobs in the fall. The hunt starts by removing the "cover" for the little creatures which by their blood sucking can take pounds off a heifer faster than you can feed them on—even when feed was much cheaper than it is this winter. This means clipping heads, necks, tails, escutcheon and along the topline. With their cover removed they aren't hard to find. If an actual count were kept there would probably be more heifers carrying lice home with them to winter quarters than do not. Under a long coat of hair they are usually missed even when heifers do a lot of rubbing.

licking and itching, both in the barn and out in the lot. And this is a pretty sure sign of trouble at the bottom of the winter coat. It's cheaper to clip and make the kill by periodic treatments with powder or oil or any other formulas that will do the job by treating at seven to ten day intervals for at least three treatments, than to feed them.

The advantages of keeping the "soon due" cow or heifer close enough to the barn in a small lot when she can be conveniently seen several times daily as she approaches calving is generally not appreciated until a feature herd member is lost by following the rule of averages rather than being prepared for the unusual. This was a last summer observation. The veterinarian was at the farm, the feed man happened in shortly after I did and it was soon a case of three hands at work trying to help get a calf from a heifer that had been trying alone for some 36 to 48 hours. But it proved to be "too late" help.

She hadn't come up with the herd one night so it was assumed she had calved and was O.K. And she wasn't found the second night when the boy went after the cows. An after-supper hunt after a full day at haying proved of no avail and it was nearly noon the next day before anyone could find time to locate her. What was assumed to have happened, hadn't. She had been trying to calve but couldn't. Infection followed the assisted birth of a dead calf and the heifer was lost. It was a loss of at least a $400 heifer to the owner and to the breed perhaps a bigger loss. Other daughters of her sire are averaging over 10,000 lbs. of milk. Her dam was the highest record daughter of one of the ten top Approved sired in the breed—a cow that averaged 42 lbs. of milk per day for every day she was in milk for six years and on twice a day milking. The reward for having taken time to have checked up when the heifer was first missed would have been at the rate of about $100 per hour. As it was a top heifer was lost and there was a veterinarian bill of nearly $25.

Many other comparably common-place experiences which cost dairymen dollars might be sighted. Training one's self to watch for trouble and then acting to avoid its toll would seem to be a suggestion with merit. You only have to lose one or two cows or a top calf or two, to change a lot of profit above feed cost dollars on several cows into a zero.

Quick Maturity

Condensed from The Hog Breeder

W. B. Fairbanks, Elmer Roberts, and W. E. Carroll

FROM a random population of registered Hampshire swine, selection based entirely on weight for age has been made through three generations for a rapid-gaining strain and a slow-gaining strain.

The foundation animals for the two strains were selected on the basis of weight at 180 days of age from 41 head of Hampshire boar pigs and 42 head of Hampshire sow pigs from the 1939 spring farrow of 48 Illinois Hampshire herds. The five most rapid gaining boars and the 15 most rapid gaining sows constituted the foundation for the rapid-gaining strain, and a like number of the slow-gaining boars and sows were selected as the foundation for the slow-gaining strain. The two herds have been carried as closed herds. The parent stock for the succeeding generations has been selected on the basis of weight for age.

Two lines have been established. The differences in the average weight of the pigs between lines by generations are: First generation, 14.0 pounds; Second generation, 9.5 pounds; and Third generation, 32.1 pounds. The difference between lines is largely due to a decline in gaining ability of the slow-gaining strain rather than to improvement in the rapid-gaining strain. The weight data indicate that selection on the basis of gain has had little or no effect on milking ability. There has been a parallel decrease in average litter size in both lines, which explains the noted increase in the birth weight of the pigs during the three generations.

Body measurements have been taken at 200 pounds. The pigs of the slow-gaining strain are longer in body but not as deep as the rapid-gaining strain. The differences in length of foreleg and width of body between lines are not significant.

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FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. (1943). $2.00.

America's Garden Book — By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons (1939). $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beekeeping — By Everett Franklin Phillips, Professor of Apiculture, Cornell University. The Macmillan Co. $4.00.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Dairy Cattle and Milk Production — By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science — By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Farm Shop Practice—By Mack M. Jones, M.S., Agri. Engineering, Univ. of Mo. McGraw-Hill Book Co., Inc. $2.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. The Macmillan Co. $3.25.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing—By V. B. Hart, Ext. Professor of Farm Management; M. C. Bond, Ext. Professor of Marketing; L. C. Cunningham, Ext. Asso. Professor of Farm Management; all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

Farm Accounting—By Donald R. Mitchell, Asst. Prof. Agri. Economics, Univ. of Wisc. McGraw-Hill Book Co., Inc. (1941). $2.50.

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Economics, Iowa State College. Iowa State College Press. $2.50.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Gardening for Good Eating—By Helen Morganthau Fox, Gardener and Author. The Macmillan Co. $2.50.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

Home Vegetable Gardening—By Charles S. Nissley, Extension Horticulturist in Vegetable Growing. Rutgers Univ. Press (1942). $1.50.

How to Raise Rabbits for Food and War—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Plowman's Folly — By Edward H. Faulkner. University of Oklahoma Press (1943). $2.00.

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw-Hill Book Co., Inc. $4.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Poultry Management—By James E. Rice, Emeritus Professor of Poultry Husbandry, and Harold E. Botsford, Extension Professor of Poultry Husbandry, both at New York State College of Agriculture. Fourth Edition (1940), John Wiley & Sons, Inc. $2.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Sheep—By Levi Jackson Horlacher, Prof. of Animal Husbandry, Univ. of Kentucky. The Interstate Printers and Publishers. $2.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of the Horse—By George R. Conn, B.S.A.H., D.V.M., Orange Judd Publishing Co., Inc. (1942). $1.50.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

Soybeans—Gold from the Soil — By Edward Jerome Dies. The Macmillan Co. $1.75.

The Home Veterinarian's Handbook—By E. T. Baker, Veterinarian, Moscow, Idaho. The Macmillan Company (1943). $2.50.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

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